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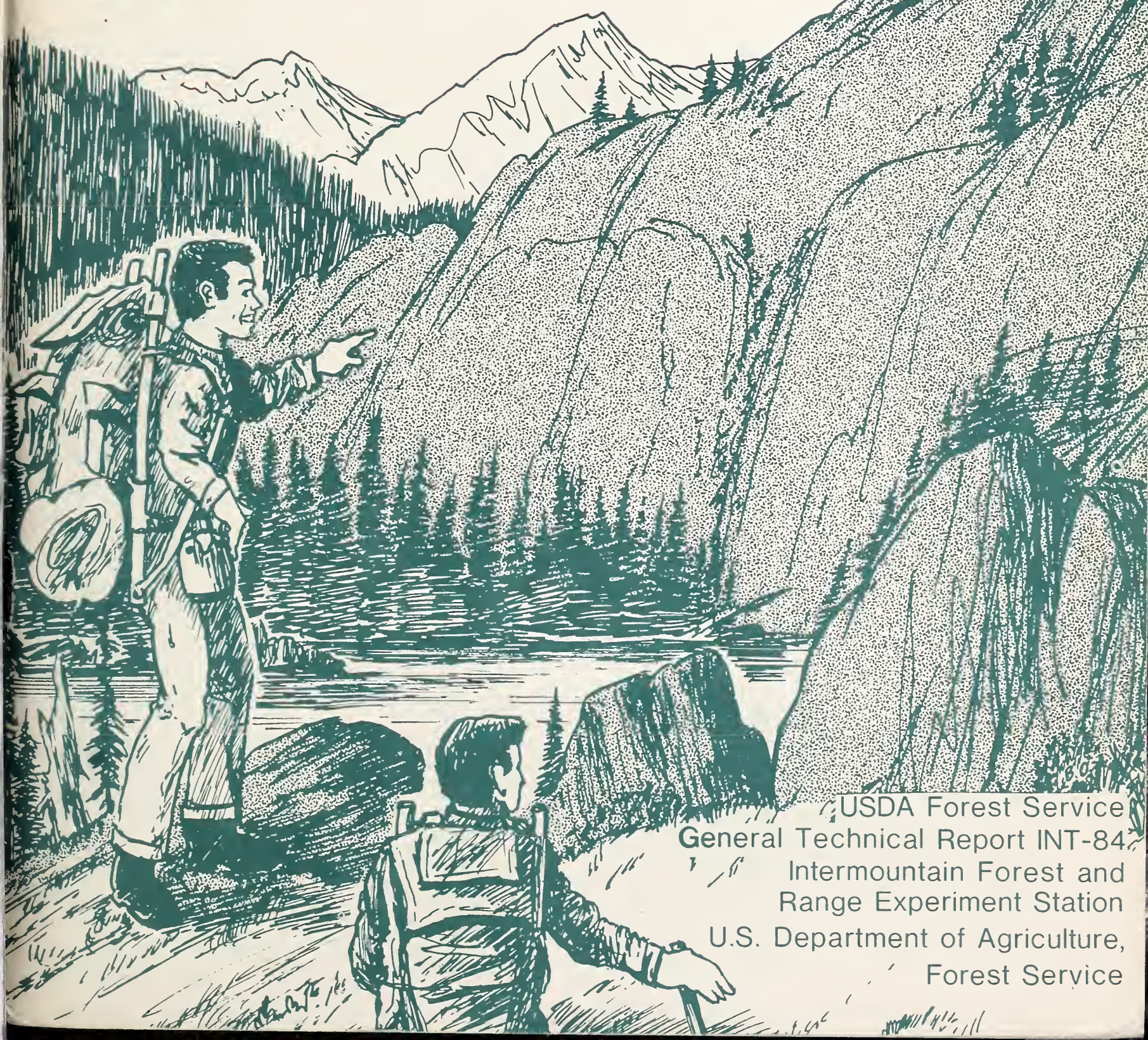
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IMPACT OF BACKCOUNTRY RECREATIONISTS ON WILDLIFE:

AN ANNOTATED BIBLIOGRAPHY

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Forest Service

THE AUTHOR

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RESEARCH SUMMARY

An annotated bibliography and evaluation of the literature on the effects of backcountry recreationists on wildlife. Literature was taken from biological, managerial, sociological, and popular publications. Orientation includes descriptions of impacts and methods of reducing impacts of recreationists on wildlife.

ACKNOWLEDGMENT

I would like to express appreciation to John Maiorano for patient and competent assistance in many painstaking tasks in the preparation of this manuscript.

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ON WILDLIFE:
AN ANNOTATED BIBLIOGRAPHY

compiled by
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INTRODUCTION

The impact of recreationists on backcountry resources has increased as the numbers of recreationists have grown and the quantity of wildlands has decreased. Recreational impacts on campsites, trails, and vegetation have frequently been documented.¹ However, the effect of backcountry recreationists on wildlife has been given less attention, probably because most wildlife species are not fixed to the spot (as are plants) and, therefore, recreational effects are not immediately evident.

Outdoor recreation is increasing at a greater rate than the national population. Backcountry areas that previously were virtually unknown to recreationists are now receiving steady traffic. Roading, logging, mining, resorts, and other forms of development compound impact problems by reducing wildlife habitat. People are interested in seeing and photographing wildlife, including highly vulnerable wildlife such as nesting birds, wintering ungulates, and whales on calving grounds. Hikers and crosscountry skiers are invading wildlife habitat in numbers that have caused wildlife to cease using otherwise desirable habitat. This is particularly true in areas where hunting is allowed. Animals conditioned to hunting usually flee from people, and this may be desirable for potentially dangerous species such as bears; however, land managers are having to restrict recreational use of critical habitat to reduce wildlife harassment. In fact, critical habitat of wildlife species vulnerable to harassment should be the primary target of management aimed at protecting these species.

In national parks and refuges, many wildlife species are habituated to people and accept humans as a harmless element of their natural habitat. Nevertheless, the pressure of recreationists in national parks has increased to the extent that, since 1975, a number of studies have been conducted to determine the effects of visitors on wildlife.

Wild animals are an integral component of American wilderness. They are indicators of wildness. This bibliography is, in part, a response to the concerns of land managers and recreationists who appreciate the value of wildlife and wish to reduce the harassing effects of increasing man-wildlife encounters. It is an attempt to determine the state-of-the-art--to identify what is already known concerning man-wildlife interactions. Much of the available literature is only peripherally concerned with man-wildlife interactions, and the annotations are concerned only with those interactions; they are not total abstracts.

Criteria for selection of papers were that they:

1. Describe the interaction of recreationists with some species of wildlife in a natural setting; or
2. Present research findings or techniques that could be used to reduce man's impact on wildlife.

Recreation--skiing, backpacking, hiking, photographing, and birdwatching--was considered "backcountry" where it affected wildlife in natural, undeveloped areas whether they were wilderness as defined in the 1964 Wilderness Act (PL 88-577) or lightly-roaded. However, the emphasis was on lands that were not heavily used by motorized vehicles.

¹Wall, G. 1977. Impacts of outdoor recreation on the environment. Council of Planning Librarians, Exchange Bibliography 1363. 19 p.

The effects of hunting and fishing, roads and road construction, logging, and off-road vehicles are not the focus of this paper, but bibliographies, symposia, and literature reviews on these subjects are included in the final section of this bibliography. The references are predominantly North American.

The Wilderness Management Research Work Unit at the Forestry Sciences Laboratory in Missoula is presently preparing a bibliography on the impacts of recreation on soils and vegetation to complement this bibliography on recreational impacts on wildlife.

EVALUATION OF LITERATURE

The problem with which this bibliography is concerned is unintentional harassment of wild animals. The major source of the problem is the recreationist who innocently produces stressful situations for wildlife. Examples of this type of harassment are the birdwatcher who pulls down a tree limb to look in a nest or the photographer who cuts the surrounding vegetation so he can get an unobstructed photograph of a bird nest. Backpackers who camp near a critical waterhole or mineral lick may, without realizing it, inhibit wildlife use of the area. Crosscountry skiers who ski too closely to deer or elk, whose movements have been restricted by snow depths and whose strength is exhausted by lack of food, cause stress and unnecessary expenditure of vital energy. These and many other innocently produced stressful situations may result in excitement, disruption of essential activities, severe exertion, displacement, and possibly death for some animals. Often impacts are not recognized until the damage is irreversible.

Healthy animals with ample food and refuges from sources of disturbance can withstand more harassment than animals that are already experiencing stress as a result of unusual weather condition, malnutrition, giving birth, or living where security areas are not readily accessible. Management efforts are not as critical for these healthy animals.

Human Impacts Literature

The human impacts literature was separated into papers that were mainly concerned with harassment or habituation and those that were mainly about a particular animal species, but also included information on human impacts.

HARASSMENT AND HABITUATION

Technology has advanced to the point where we can begin to assess the behavioral and physiological effects of human disturbance on big game animals by means of heart-rate telemetry, as well as by radio tracking of animal movements. This may prove to be a key to understanding the tolerance levels of specific wild populations to different forms of recreation. The biotelemetry information we have (Ward 1973, 1977; Lieb 1978; McArthur and others in press) is significant, as is the work of Moen (1976, 1978) and Geist (1971a) on energy conservation in wintering ungulates. More information on the effects of recreationists on the behavior and physiology of wild animals is needed.

The reality of habituation of wildlife to man is well-documented (Geist 1975b). Animals can learn to avoid certain situations (Smith and Geis 1956) and they can habituate to some recreational activities (Geist 1972). A "how to" publication pointing out the benefits as well as pitfalls of habituation would be interesting and useful. However, application of habituation as a management technique would be unrealistic where animals are subjected to hunting.

HUMAN IMPACTS ON SPECIFIC SPECIES

The reaction of various animal species to human disturbance has only recently been investigated. Much of the information presented here was extracted from papers that focus on some problem other than human disturbance.

I was unable to locate publications describing backcountry recreation impacts (other than fishing) on fish. However, the following examples were brought to my attention:²

1. Recreationists harassing spawning fish that are exposed on spawning sites.
2. Salmon reacting positively toward vehicle and stock fords for selection of a spawning (redd) site.
3. Salmon redds destroyed by fishermen wading to fish for trout.

The effect of people on nesting birds, especially bald eagles and osprey, is well-documented (Mathisen and others 1977; Garber 1972; and others). Except where birds are habituated, the presence of people is generally a negative impact. Servheen (1975), Stalmaster and others (1978), and Shay (1973) have documented human impacts on wintering bald eagle populations and made management suggestions.

Presently, the primary effect of people on songbirds and small mammals is indirect through modification of the structure of the vegetation (Garton 1977; Garton and others 1977), rather than direct interaction with the animal. The same is probably true for insects, amphibians, and reptiles. Aggressive birdwatchers, however, can cause songbirds to abandon their territories. Some birds and small mammals are also attracted by the food remains of campers (Garton 1977; Garton and others 1977).

Limited information exists on the impact of recreation on hibernating bats and maternity colonies. Structures built at entrances to caves restrict air movements, and cave temperatures may become too warm for survival of hibernating bats. Disturbances of hibernating bats and maternity colonies by recreationists or biologists cause bats to fly and use fat reserves critical to winter survival. Unnaturally high mortality results (Humphrey 1978; Petit 1978).

The only information located on recreational impacts on marine mammals was in popular articles describing harassment of whales by tourists in small boats who wish to see, photograph, or touch the whales (Payne 1979; Hudnall 1977).

²Personal Communications. G. Munther, Lolo Nat. For. Fisheries Biologist, Missoula, Mont., and T. Bjornn, Idaho Coop. Wildlife Unit, Moscow, Idaho.

Cats, wolves, weasels, martens, and other mustelids are poorly represented in the literature on human impacts. Because of their elusiveness, they are difficult to study and are infrequently seen. Many of these animals require remote wildlands and undoubtedly man's invasion of the backcountry has affected them. This is an area that needs research. As predators, they are incompatible with agricultural land uses involving livestock. The literature indicates that wolves and mountain lions require protected areas as population reservoirs (Chapman 1977; Peterson 1977; Saile 1977). Wolves require some protection from trapping and from human intrusion near dens. Lions require areas with partial protection from hunting, but we know little about man's effect as a nonhunting recreationist on any of the cats.

Research on bears has been extensive, with many publications suggesting management techniques for both bears and recreationists using bear country. Most of these relate to proper securing of food and disposal of garbage as well as informing the public concerning appropriate behavior in bear country. Information on routing trails and backpackers relative to areas of bear activity is available.

Information is available on elk in relation to highways (Ward 1977), logging (Hieb 1976), and visitors in national parks (Shultz and others 1978), but we need more information on the effects of man (disassociated from roads) on wild populations with respect to winter range, calving, and distribution on summer range. Human recreation probably prevents elk from using many important alpine meadows during summer and fall.

The impacts of snowmobiles, highways, and feral dogs on deer have been researched. Bibliographies covering these subjects are listed in this publication. Deer, like coyotes, however, are remarkably adaptable as a species and are not in danger of extinction. Moen's (1976 and 1978) publications on physiological adaptations and Ward's (1977) publication on biotelemetry research on deer are valuable contributions to the harassment literature.

Moose are relatively unconcerned about encounters with people (Dennison 1956; McMillan 1956; DeVos 1958), and, therefore, they are probably not as vulnerable to harassment as other ungulates. However, because moose are often slower to take flight than other ungulates, they are more vulnerable to poaching.

Information on caribou is largely a result of research on the potential impacts of the Alaska pipeline. Only the literature dealing with human interactions is included here. Management recommendations are made in several of these papers.

No papers discussing the effects of recreationists on antelope were found, although Ward (1977) has investigated their reactions to highways and fencing.

Publications on mountain goats specifically address problem areas in national parks (Bansner 1976; Holroyd 1967; Singer 1978). In these cases, man is sometimes the target of harassment from goats. More information on the impact of man as a recreationist on goat populations outside of national parks would be useful.

Among the ungulates, bighorn sheep have received the most attention in the human impact literature. DeForge (1962 and 1976), Dunaway (1970 and 1971a, b), and others believe that human encroachment on bighorn habitat is responsible for the decline in sheep populations. Research has been conducted to identify the kinds of recreation that have detrimental effects on sheep (Elder 1977; Hicks 1977). Because sheep are relatively easily habituated, potential management possibilities are increased (Geist 1975c).

Summarizing the reaction of different animals, even within the same species, to human intruders is very difficult because the responses are so divergent; however, some generalizations relating to management can be made. Critical habitats (waterholes, salt licks, winter ranges, etc.) usually need protection from human intruders. Animals may also need protection during critical times of year. Animals with limited food supplies (ungulates on winter range, bats in hibernacula) are an example. Another example is the need for protection when young are present. This need is documented in this bibliography for seabirds (Gochfeld 1978; and others), loons (Ream 1976), bald eagles (Mathisen and others 1977), osprey (Ames and others 1964; and others), caribou (Stelfox and others 1978), elk (Lieb 1973), and bighorn sheep (Woodward and others 1974; and others). Birds and mammals, if frightened, may abandon young and leave them vulnerable to predation or excessive heat or cold.

Generally, wild animals are not significantly impacted by low-level, nonaggressive sharing of habitat with man. However, recreationists, because of their numbers and sometimes inappropriate behavior patterns, are causing severe impacts. Some examples are:

Grizzly bears' existence in Montana depends on their use of low-elevation ranchlands for part of the year. Bears and ranchers have coexisted for years. Now subdivisions and ski resorts are being built on some of the ranchlands. These land uses are not compatible with bears. People new to the area (and their pets) do not know the rules of bear etiquette. Bears do not know the rules of subdivision etiquette. There are too many man-bear encounters, and bears are killed.

Sawyers working in the woods frequently report deer and elk feeding in full view while they are felling. However, when a massive logging operation is in full swing, the ungulates generally move out. Too many people and too much noise create an intolerable situation for these animals.

Loons and eagles traditionally nested on the shores and islands of certain lakes which had only a few residences. As these lakes became ringed by cottages or opened to public water recreation, the birds no longer nested there. The new people (recreationists), because of their numbers and inappropriate behavior, are unacceptable to these birds.

For people and wildlife to coexist, people must behave in a manner acceptable to animals (and vice versa). Additionally, there is a limit to how many disturbances per unit time (even nonaggressive disturbances) animals will tolerate. This tolerance will vary with each local population, but it is a very important criterion to establish if wild animals are desired in an area.

Harassment Reduction Literature

WILDLIFE MANAGEMENT AND HABITAT MANIPULATION

The distribution of wild animals can be affected by conditioning them positively or negatively to human activities (Geist 1972; Smith and others 1956; Batcheler 1968). Bergerud (1971) has even suggested the possibility of genetic manipulation of caribou to achieve greater tolerance to man's activities or the reverse effect, if that is desired. These techniques will be restricted by the management objectives of specific areas.

Information on habitat modification specifically designed to control distribution of wildlife is limited. Most of the available information describes the effects of logging, roads, fire, or recreational use on animals. More research on habitat modification specifically designed to attract or divert wildlife would be useful.

For example, Geist and others (1974) suggest the use of fertilizer to attract ungulates to areas of more palatable vegetation. This could be used in habituating animals to humans or attracting them away from areas of interaction with recreationists. Fire, logging, salt, and waterholes have potential for redistributing wildlife. This field of literature has not been covered in this bibliography. There is considerable information available on the effects of fire and logging on wildlife populations, some of which could be applied in designing research to affect the distribution of wildlife relative to recreation areas.

The use of vegetative screening is a habitat management technique suggested in several papers on species as diverse as bald eagles (Stalmaster 1976; Stalmaster and Newman 1978; Nature Conservancy 1976), elk (Ward and others 1973), and mountain goats (Singer 1978). Screening the visibility of people apparently makes some animals more secure and managers might want to consider this technique. However, animals are sometimes more at ease when they have a clear line of sight of potential danger (Stalmaster 1976; Servheen 1975).

RECREATION MANAGEMENT

Understanding the perceptions and attitudes of recreationist is fundamental to recreation management. This has been accomplished on a national scale by Kellert (1976a, b; 1977a, b). We also need to understand the behavior of recreationists--when they go, where they go, and what they do.

Wildlife education is an important aspect of managing recreational use patterns. There are very few wildlife education programs. An assessment of potential methods of sensitizing the public to wildlife problems is needed. Programs at visitor centers, the wildlife safari concept (Lime and others 1978), wildlife films for schoolchildren, and perhaps a certification program for backcountry users (Wagar 1940) deserve investigation. This is a fertile field for innovative research.

Popular articles that discuss impacts of recreational activities on wildlife populations are educational. *Ski Trails and Old Timers' Tales* (Watters 1978) has a section on wildlife, warning skiers of the vulnerability of wintering ungulates. On the other hand, articles like Curtis' (1977) "Hiking Animal Trails," which encourage recreationists to follow animal trails, could be detrimental to vulnerable species.

Recent popular articles address the impact of "nonconsumptive users" on wildlife. Whale-watchers, birdwatchers, and photographers, as well as people who are simply hiking, all affect wildlife. These nonhunters are not actually nonconsumptive. They also have very significant impacts on wildlife. Articles describing nonconsumptive impacts should help people who are "loving wildlife to death" appraise the situation, especially when they offer guidelines for appropriate behavior and management suggestions.

An on-the-ground investigation of methods being used by managers to modify visitor behavior and use patterns is needed. Innovative techniques similar to those described by Wagar (1975 and 1977) are presently in use in this country. Positively worded signs; explanation of impacts; provision of alternative swimming, fishing, and hiking areas; timing of recreational use to avoid wildlife-use conflicts; and planning wildlife viewing areas for minimum impact to the animals are all possible solutions. A survey of methods currently in use (including subtle methods) could be followed by research on effectiveness of different methods in various situations. A publication describing various people-management techniques would be useful.

An analysis of the impacts of wilderness management on wildlife (as related to trails, campsites, garbage disposal, improvements, and dispersal of visitors) would be enlightening. For instance, the stocking of fish in cirque lakes has an indirect effect on mountain goats because of the increased human use of stocked lakes. Foot-bridges allow early spring access to wildlife habitat that might otherwise be undisturbed until water levels have lowered. Additional trails on ridges or valley bottoms mean less habitat is available to retiring wildlife species. These are impacts that need consideration in management plans. Unfortunately, the best wildlife habitat is also usually the choicest location for campsites, trails, roads, agriculture, cities, etc. When running pellet counts on the contour, one soon discovers that very few animals defecate on steep, north-facing slopes with prodigious quantities of downed timber, or in "dog hair" lodgepole stands. However, at the first pleasant, flat place the ground is invariably liberally sprinkled with pellets.

In conclusion, three approaches to reducing wildlife harassment are evident: (1) People management (spatial, temporal, and behavioral); (2) wildlife management, in the sense of modifying behavioral responses to certain recreational activities; and (3) habitat modification to affect the spatial distribution of wildlife. None of the approaches offer simple solutions. The behavior of both people and animals is complicated and not easily predicted.

The variation in behavior toward man within single species of animals, sometimes within the same location, is demonstrated repeatedly in this bibliography--Mathisen and others (1977) and Stalmaster and others (1978) for bald eagles; Welles and Welles (1961) and Hicks (1977) for bighorn sheep; Altman (1958) for elk; Holroyd (1967) for goats. Some of the behavioral variation is due to variation in the animals' physiological state; some is due to an individual animal's past experience; and some is due to the reaction of the rest of the animals in the group. An interesting example is cited in the bighorn sheep section of this bibliography. Light (1971) notes that bighorn ewes with lambs are less tolerant of human approaches than are individual ewes and rams. McCann (1956) notes that bighorn ewes and young were tolerant of human presence, but rams took flight at the sight of man. This he considered to be the result of hunting pressure on rams. Welles and Welles (1961) give many examples of the variation in behavior of individuals within the same band of sheep. Elk in Wyoming apparently are much more tolerant of the sight of people than elk in Montana (Hieb 1976). Although we can say, generally, that moose are not as quick to flee from man as deer or elk, the variation in individual behavior certainly overlaps; for example, some moose have a shorter flight distance than some deer.

The behavior of the people interacting with wildlife also ranges from those who take potshots at animals to unobtrusive observers. For these reasons, it is very difficult to prescribe general management procedures for any species. Management must be specific for each area and conform with the management objectives of the area.

The primary targets of management should be the critical times of the year and key locations of wildlife species vulnerable to harassment. Time and effort spent in alleviating harassment in other situations is wasted if habitat loss and wildlife mortality continue to occur at critical times and places. A perceptive land manager who has lived in the area a number of years, who has a sound biological background, and who knows the local climate, weather, topography, and vegetation, as well as the local recreation patterns, is the most qualified person to prescribe a solution fitted to his area. I hope the papers in this bibliography will provide managers some new insights into problem solutions. Sometimes an unconventional approach sparks an avalanche of ideas, one of which may be a feasible solution.

ORGANIZATION OF BIBLIOGRAPHY

AND HOW TO USE INDEX

The major headings of the bibliography are: Human Impacts Literature; Harassment Reduction Literature; and Bibliographies of Closely Related Subjects. All papers are numbered. If the desired information is not included under the headings, check the Keywords Index.

Each publication was put into the category that best described its major emphasis. Some papers fit into several categories. In these cases, the number of the paper is cross-referenced under other appropriate headings.

Included in the index is an alphabetical listing of the authors and keywords, with reference numbers. Common names are used in the keywords index. A taxonomic reference for all species occurring in the keywords has been prepared.

The keywords include species (common name), descriptive terms (harassment, danger, human disturbance), and place names (Wisconsin, Glacier National Park). Many of the keywords overlap. For example, the words "recreationists," "skiers," "hikers," "photographers," etc., all imply human disturbance. When the type of disturbance was not obvious, "human disturbance" was used. "Human impact" was used when the paper included effects of people beyond just physical interaction; for example, grazing, subdivision, roads, etc. The word "harassment" implies that the disturbances were excessive.

Each of the indexing systems can be used in looking for sources. For example, when searching for papers on elk management, one can look under (1) "elk" in the major headings; (2) "elk" and "wildlife management" in the keywords and check for matching reference numbers; or (3) authors known to have worked on elk.

Initially, the purpose of this bibliography was to let managers know what information is available. However, it was later realized that annotations on the man-wildlife interaction information contained in the papers would be a useful addition. Therefore, annotations have been included to the extent possible. Annotations in quotes are from the authors' abstracts. Although this bibliography will be partially out of date before it is published, because of the growing concern for wildlife it should be useful for references published through 1978. Additional information and publications will be graciously received.

Human Impacts Literature

HARASSMENT AND HABITUATION

(Also see reference numbers 57, 73, 84, 146, 147, 178, 186, 189, 227)

1. Blacklock, L.
1977. Encounters in the wild. Natl. Wildl. 15(6):25-29.

Describes how sheep gradually became habituated to author's presence as a photographer.

KEYWORDS: Dall sheep, photographers, habituation.

2. Cahalane, V. H.
1940. Some relationships of wildlife to the field of recreation. Utah Juniper 11:8-10.

Points out generally detrimental effect of man on wildlife in recreation areas. Suggests that cooperation is essential if wildlife and human use are to be successfully combined on recreational areas.

KEYWORDS: Wildlife, recreation.

3. Carothers, S. W., and S. W. Aitchison.
1976. An ecological survey of the riparian zone of the Colorado River between Lees Ferry and the Grand Wash Cliffs, Arizona. Colorado River Tech. Res. 10, Grand Canyon National Park, Arizona. 251 p. (NTIS Access, No. PB26777OAS).

Reports abnormally high and unhealthy populations of rock squirrels and mule deer resulting from feeding by hikers. Lizard populations have been reduced through reduction of driftwood which they need for shelter, foraging, etc. Human use causes destruction of nests and burrows of ground dwelling vertebrates.

KEYWORDS: Rock squirrels, mule deer, lizards, hikers, Grand Canyon National Park.

4. Chester, J. M.
1976. Human wildlife interactions in the Gallatin Range, Yellowstone National Park, 1973-1974. M.S. thesis. Mont. State Univ., Bozeman. 114 p.

In Gallatin Range of Yellowstone National Park an inverse relationship exists between intensity of human use and frequency of wildlife observation. Frequency of wildlife encounters by on-trail and off-trail travelers is described as a function of time of year, altitude, noise, and party size. Some management suggestions are given for backcountry recreation.

KEYWORDS: Elk, mule deer, moose, grizzly bear, black bear, bighorn sheep, coyote, hikers, Yellowstone National Park.

5. Clevenger, G. A., and G. W. Workman.
1977. The effects of campgrounds on small mammals in Canyonlands and Arches National Park. Trans. North Am. Wildl. Nat. Resour. Conf. 42:473-484.

Campgrounds have some influence on populations of small mammals inhabiting them. Opportunistic feeders such as wood rats, Colorado chipmunks, and deer mice utilized campers' food resulting in higher populations of such species in campgrounds. Ord's kangaroo rat, desert cottontail, and antelope ground squirrel that did not have higher populations in campgrounds may be more specialized feeders. The amount of escape cover near campsites may affect the number of animals using them.

KEYWORDS: Woodrat, Colorado chipmunk, deer mouse, Ord's kangaroo rat, desert cottontail, antelope ground squirrel, campgrounds.

6. Curtis, S.
1977. Hiking animal trails. Backpacker 5(5):44-85.

Tells how to find and follow animal trails on hillsides, in brush or timber, on saddles and passes, and on ridgelines. The author finds that this form of recreation is personally satisfying and allows one to escape crowds.

KEYWORDS: Wildlife, hikers.

7. Fletcher, J. L., and R. G. Busnel, eds.
1978. Effects of noise on wildlife. 320 p. Academic Press, Inc.

Presents data from several disciplines on the effects of noise on behavior and physiology of wildlife and how this information is relative to protecting wildlife and preserving endangered species.

KEYWORDS: Wildlife, noise.

8. Garton, E. O., C. W. Bowen, and T. C. Foin.
1977. The impacts of visitors on small mammal communities of Yosemite National Park. In Visitor impacts on National Parks: The Yosemite ecological impact study. p. 44-49. T. C. Foin, Jr., ed. Univ. Calif., Davis, Inst. Ecol. Publ. 10, 99 p.

Peromyscus maniculatus (deer mice) increased in response to human use of forested areas. *Microtus montanus* (voles) showed no change in density with human use; however, *Microtus* did withdraw when trampling was heavy enough to eliminate all vegetation. The differences in response were attributed to the herbivorous diet and a cyclic nature of population levels of *Microtus*, whereas *Peromyscus* is less subject to population cycles, has a less specialized diet, and may take advantage of food debris left by campers.

KEYWORDS: Deer mice, voles, human impacts, Yosemite National Park.

9. Garton, E. O., B. Hall, and T. C. Foin.
1977. The impact of a campground on the bird community of a lodgepole pine forest. In Visitor Impacts on National Parks: The Yosemite ecological impact study. p. 37-43. T. C. Foin, Jr., ed. Univ. Calif., Davis, Inst. Ecol. Publ. 10, 99 p.

Describes effects of campgrounds on bird communities. Reaction of birds to humans in a campground was highly species-specific and varied even within the species. Birds were affected by modification of the vegetation structure, actual human presence, and the food debris in campgrounds. In this study, Brewer's blackbird, the brown-headed cowbird, and robins were significantly more abundant in campgrounds than the surrounding area and Oregon juncos were significantly less abundant.

KEYWORDS: Brewer's blackbird, brown-headed cowbird, robin, Oregon junco, campgrounds, Yosemite National Park.

10. Geist, V.
1970. A behavioral approach to the management of wild ungulates. In Scientific management of animal and plant communities for conservation. p. 413-424. E. Duffer and A. S. Watt, eds. Eleventh Symp. Brit. Ecol. Soc., Blackwells Sci. Publ., Oxford. 652 p.

Gives examples of man and wild ungulates cohabiting towns in Canadian National Parks. States that behavior of wild animals towards humans is largely a consequence of human behavior toward them. Animals are as wild as man teaches them to be. Cites examples of physical effects of harassment on wild animals. Concludes, "Where visitors are common, steps may have to be taken to educate both visitors and the animals."

KEYWORD: Ungulates, harassment, habituation, wildlife management, education, Canadian National Parks.

11. Geist, V.

1971. Is big game harassment harmful? Oilweek 22(17):12-13.

The cost of harassment of big game in the North is considered in terms of energy budgets and physical and hormonal damage. Calculates the "cost" of harassment to big game in the Canadian arctic and subarctic, in terms of kilocalories/minute above and beyond normal daily expenditures. The amount of forage required by harassed animals may exceed what is available. Chasing animals in cold weather, through crusted snow, and during calving may significantly increase mortality. Chronic harassment can result in reduced reproductive rates.

KEYWORDS: Ungulates, winter, harassment.

12. Geist, V.

1972. On the management of large mammals in National Parks. Park News 8(4):7-14, 8(5):16-24.

National Parks should provide for the preservation of natural ecological relationships as well as for the preservation of one viable population of each subspecies of wildlife living within the park boundaries. Park boundaries should be determined biologically, not politically. Research on the biology of large mammals on a species-specific basis is needed to determine each species' living requirements. In particular, questions that need to be answered are minimum population size to ensure viable populations and the impact of human activities on large mammals.

KEYWORDS: Wildlife management, national parks.

13. Geist, V.

1975b. Harassment of large mammals and birds. Report to the Berger Commission, MacKenzie Valley Pipeline Inquiry, 62 p.

Excellent definition of harassment, its causes and effects, and animals' defenses against harassment. Suggests research direction. Evaluates research submitted by Arctic Gas Study Ltd. Examines effects of roads and suggests measures to reduce impact.

KEYWORDS: Birds, wildlife, harassment, aircraft.

14. Geist, V.

1975c. Mountain sheep and man in the northern wilds. 248 p. Cornell Univ. Press, Ithaca, N.Y.

Personal experiences of a research biologist studying bighorn sheep in the Canadian Rockies. Chapter on author's experiences with habituated sheep and other species of wildlife. Philosophical insights into animal behavior and evolution.

KEYWORDS: Bighorn sheep, habituation, British Columbia.

15. Glinski, R.

1976. Birdwatching etiquette: the need for a developing philosophy. Am. Birds 30:655-657.

Points out types of disturbance caused by birdwatchers and the lack of regulation of interactions of man with nongame species of wildlife. Lists five rules of etiquette as a foundation for birdwatchers to build on:

1. Avoid use of tape recorded territorial calls of rare birds during their breeding season.
2. Do not cause disturbance at nests.
3. Do not harass rare birds.
4. Respect property and wishes of private landowners.
5. Do not patronize large groups of birdwatchers lacking responsible guides.

KEYWORDS: Birds, birdwatchers.

16. Hammond, J. L.

1974. The role of wilderness areas in wildlife management. Pac. Wilderness J. 1(6):10-11.

Points out that wildlife is an integral component of wilderness, and that many species need the protection that wilderness management can provide. Some wildlife species apparently cannot live in close proximity to man.

KEYWORDS: Wildlife, wilderness, harassment.

17. Hudnall, J.

1977. In the company of great whales. Audubon 79(3):62-73.

Describes harassment of whales in California where fleets of boats follow migrating gray whales, and in Hawaii where whale watchers in powerboats "dive-bomb" surface whales, frighten cow and calf humpbacks from traditional nursery refuges, and interrupt courting whales. In some areas hydrofoils pass through whale mating and calving areas several times a day. In addition to disturbance and possibility of collision, hydrofoils inhibit the singing of humpbacks. Author proposes rerouting hydrofoils, regulating numbers of whale-watching boats, and a national park or wildlife refuge to protect Hawaiian humpbacks.

KEYWORDS: Humpback whale, gray whale, harassment, recreation management, Hawaii, California.

18. Johnson, R. R.

1977. Synthesis and management implications of the Colorado River research program. Grand Canyon National Park Colorado River Series, Contribution 47, 75 p.

Contains short section on impact of recreationists on vertebrates in the Grand Canyon. Data cited are from Carothers and Aitchison, 1976.

KEYWORDS: Rock squirrels, mule deer, lizards, recreation, Grand Canyon National Park.

19. Kregosky, B.

1972. 1971 Great Divide Trail impact study. Can. Wildl. Serv. (unpubl. rep.), 215 p. Edmonton, Alberta.

Includes section on the potential effects of the development of the Great Divide Trail on the local fauna from ground squirrels through ungulates and bears. Expresses concern about disturbance heavy trail use may cause to retiring species of animals. The result may be further reduction of habitat for species whose existence is already threatened by man. Ungulates may abandon migration routes in areas where trail use is heavy. Bears may be attracted by refuse. Coyotes and some small mammals may increase, deriving sustenance from campers.

KEYWORDS: Wildlife, trail impacts.

20. Leopold, A. S. (Chairman)

1963-1968. Reports of the Special Advisory Board on Wildlife Management. Trans. North Am. Wildl. Nat. Resour. Conf. 28, 29, 33.

Examples of effect of man on wildlife in refuges. Suggests management that will restore wildlife to wild condition. Wildlife enhancement should take precedence over recreation in refuges.

KEYWORDS: Wildlife management, refuges.

21. Lieb, J. W.

1978. Biotelemetric monitoring of heart rate and activity in elk. USDA For. Serv., Intermt. For. and Range Exp. Stn., Final Progr. Rep., Res. Work Unit FS-INT-1705, 36 p. Ogden, Utah.

Heart rate activity biotelemetry systems were installed in captive elk. The systems did not perform as effectively as had been expected; however, meaningful data were collected. Heart rate and signal strength traces could be reliably interpreted as specific elk activities. Seasonal mean heart rates were dependent on ambient temperature, increasing from a winter low to a summer high. This system will be very valuable to the wildlife manager/biologist for determining the effects of disturbance, habitat change, or management programs.

KEYWORDS: Elk, heart rate telemetry, Montana.

22. Lynch, J. F., and N. K. Johnson.

1974. Turnover and equilibria in insular avi faunas, with reference to the California Channel Islands. Condor 76:370-384.

Many island extinctions and colonizations are related to human influences. These influences include the impact of habitat modification, introduction of nonnative species, which through competition or predation eliminate native species, and the impacts of pesticides and shooting.

KEYWORDS: Birds, island populations, California Channel Islands.

23. Ream, C. H.

1979. Human-wildlife conflicts in backcountry: possible solutions. p. 153-163. In Recreational Impacts on Wildlands. Proc. R. Ihner, D. R. Potter, and J. K. Agee, eds. USDA For. Serv., Nat. Park. Serv., Pac. Northwest Region.

Biological, sociological, managerial, and popular literature was reviewed to identify the extent of human impacts on wildlife in the backcountry, and possible solutions. A major problem was recreationists who innocently produced stressful situations for wildlife. Suggested solutions included: people management (spatial, temporal, and behavioral); wildlife management, in the sense of modifying wildlife behavior responses to certain recreational activities; and habitat modification to affect the spatial distribution of wildlife.

KEYWORDS: Wildlife, human disturbance, recreation management, wildlife management, habitat modification.

24. Rymon, L. M.

1969. A critical analysis of wildlife conservation in Oregon. Ph.D. dissertation. Oreg. State Univ., Eugene. 441 p.

Study of Oregon's wildlife resources from before white settlement to present, including projections, based on present trends, up to the year 2010. Oregon's wildlife is decreasing due to competition with man for living space and resources. It appears that increasing human population may eventually eliminate many species of wildlife.

KEYWORDS: Wildlife, human impacts, Oregon.

25. Scheffer, V. B.

1974. A voice for wildlife. 245 p. Charles Scribner's Sons, New York.

Briefly acknowledges the impact of bird and beast watching on wildlife especially during breeding seasons. Suggests the possibility of a "Wildlife Education Association" to develop wildlife education programs for all educational levels. This book is mainly concerned with impact of hunting, trapping, and other consumptive activities on wildlife populations.

KEYWORDS: Wildlife, human impacts, education.

26. Schieffelin, J. B.

1973. The political aspects of wildlife management. In Wildlife and the environment: Proceedings of the Governor's Conference March 1973, Denver, Colo. p. 78-81. E. Decker and G. A. Swanson, eds. Environ. Resourc. Cent., Colorado State Univ., Infor. Series 7, 119 p.

Recreational areas are eliminating wildlife habitat. The more people in an area on foot, skis, and snowmobiles, the more the wildlife is pushed back. Recommends controlled development.

KEYWORDS: Wildlife, recreation.

27. Sheridan, D.

1978. Dirt motorbikes and dune buggies threaten deserts. Smithsonian 9(5):65-75.

People driving ORV's are destroying desert habitats. In moderately used ORV areas, plant life declined 50 percent; terrestrial animal life, 60 percent. In areas where ORV's congregate, plant life is reduced 90 percent and animal life 75 percent.

KEYWORDS: Desert animals, ORV's.

28. Stebbins, R. C.

1974. Off-road vehicles and fragile desert. Am. Biol. Teach. 36(4):203-208, 220 and 36(5):294-304.

People driving ORV's are maiming and killing ground-nesting birds, lizards, and snakes. ORV's cause collapse of burrows, soil compaction, depletion of forage, and vandalism (desert tortoise) in previously inaccessible areas.

KEYWORDS: Desert animals, ORV's.

29. Steinhart, P.

1978. Off we go, into the wild green yonder. Natl. Wildl. 16(4):16-19.

Describes the effects of aircraft harassment on elephant seal rookeries, condors, wolves, bison, waterfowl, etc. Describes behavioral changes in animals subjected to this impact. Suggests mandatory rather than advisory altitude of 2,000 feet over the terrain of parks, wilderness, and wildlife refuges.

KEYWORDS: Wildlife, aircraft, harassment.

30. Telfer, E. S.

1978. Cervid distribution, browse and snow cover in Alberta. J. Wildl. Manage. 42(2):352-361.

Studies of winter distribution of moose, elk, and mule deer. Moose utilization was positively related to browse. Deer and elk utilization was not strongly related to browse availability, but may be related to traditional winter ranges and human disturbance. Recommends maintaining the integrity of traditional winter range for deer and elk. Moose populations can be managed by manipulating browse supply.

KEYWORDS: Moose, elk, mule deer, winter, human disturbance, wildlife management, Alberta.

31. Tracy, D. M.

1977. Reaction of wildlife to human activity along the Mount McKinley National Park road. M.S. thesis. Univ. Alaska, Fairbanks. 260 p.

Some bears and foxes, and possibly, large bands of caribou avoided the McKinley Park road. Some road crossings by migrating sheep were thwarted by disturbances. Disturbances caused caribou within 200 m of the road to decrease feeding and increase movements. For ungulates, females with young were most easily disturbed. Individual animals appeared to be habituated to human activity. Most species exhibited more response to loud noises and people out of vehicles. Good bibliography on disturbance and flight distance. Peripheral information included on park regulations protecting wildlife. Includes management suggestions.

KEYWORDS: Caribou, moose, dall sheep, brown bear, wildlife, wildlife management, human disturbance, bibliography, highway, McKinley National Park.

32. Ward, A. L.

1977. The effects of highway operation practices and facilities on elk, mule deer and pronghorn antelope. Project No. 942-41-42-13-0088-33F2-6-2580. 53 p. Annu. Rep. Fed. Highway Admin., Office of Research and Development Washington, D.C.

A study to determine the impact of Interstate 80 on elk, deer, and antelope winter range. Includes information on heart-rate-telemetered mule deer and elk. Heart rate responses to human activities, dogs, vehicles, cattle, other wildlife, and the sound of shooting are reported. Out-of-vehicle activities caused more change in heart rate than moving vehicles. Heart rate telemetry can be effectively used to measure the effect of man on wildlife.

KEYWORDS: Elk, mule deer, antelope, heart rate telemetry, highways, Wyoming.

33. Ward, A. L., J. J. Cupal, G. A. Goodwin, and H. D. Morris.

1976. Effects of highway construction and use on big game populations. Fed. Highway Admin. Off. of Res. Develop. Rep. No. FHWA-RD-76-174, 92 p. Washington, D.C.

Antelope were not disturbed by moving traffic. Fences kept antelope off highway, but deer went over fences and did not use the provided underpasses. Suggests the need for deer-proof fences. Elk were more affected by moving traffic than deer and antelope. Potential usefulness of heart rate telemetry for assessing human impacts on wildlife is recognized. The authors state, "Land managers and wildlife biologists must know the effects of human behavior on wildlife species to make proper plans for the use of land without losing the wildlife resource."

KEYWORDS: Antelope, mule deer, elk, highway, heart rate telemetry, wildlife management.

34. Waterman, G., and L. Waterman.

1977. Dogs on the trail. Backpacker 5(4):29-32.

Dogs harass wildlife and other backpackers. Dog owners must keep dogs under control and see that their behavior is acceptable to other campers.

KEYWORDS: Wildlife, backpackers, dogs.

35. Watters, R.

1978. Ski trails and old timers' tales in Idaho and Montana. 272 p. Solstice Press, Moscow, Idaho.

This guide to crosscountry skiing has a section on wildlife which warns skiers about the threat they pose to wildlife. If wild animals are forced to run they expend vital energy reserves. Suggests dogs be left at home when skiing in big game wintering areas.

KEYWORDS: Wildlife, winter, skiers, Montana, Idaho.

36. Weeden, R.

1976. Nonconsumptive users: a myth. *Alaska Conserv. Rev.* 27(9):3,15.

Dismisses the notion of consumptive vs. nonconsumptive uses of wildlife with examples of detrimental effects of "nonconsumptive users" on wildlife. Concludes there is no such thing as a nonconsumptive user; there are only consumers who care about wildlife and those who do not.

KEYWORDS: Wildlife, human disturbance.

37. Whitcomb, R. F., J. F. Lynch, P. A. Opler, and C. S. Robbins.

1976. Island biogeography and conservation: strategy and limitations. *Science* 193:1030-1032.

Discusses the need for establishing faunal reserves that are large enough to prevent faunal extinction. Human impact is one problem that may be reduced by setting aside large continuous natural areas.

KEYWORDS: Forest birds, human impacts, island populations.

38. Wilkes, B.

1977. The myth of the non-consumptive user. *Can. Field-Nat.* 91(4):343-349.

Rejects the concept that outdoor recreational activities, other than hunting and fishing, are nonconsumptive. Points out the impact of naturalists, photographers, etc., on the vegetation and wildlife. Proposes licensing back-country users and regulating numbers through a permit system. Suggests a skills test associated with licensing because of the damage caused by uninformed, unskilled people.

KEYWORDS: Wildlife, photographers, back-country certification, recreation management.

39. Williams, R.

1978. Energy crisis. *Idaho Wildlife* 1(6):33.

This editorial points out the stresses confronting wildlife during the winter: cold, snow, limited food, energy drains from rut and gestation. Suggests that photographers, skiers, and snowmobilers avoid unnecessary harassment of wildlife and that dogs and cats be kept under control year around, especially during the winter.

KEYWORDS: Wildlife, harassment, winter, photographers, skiers, dogs.

40. Wright, G. M., J. S. Dixon, and B. H. Thompson.

1933. Fauna of the National Parks of the U.S. A preliminary survey of faunal relations in national parks. Fauna Series No. 1. U.S. Govt. Print. Off., 157 p. Washington, D.C.

Recognized the importance of wildlife in American heritage and the dependence of these animals on remote wild country provided by national parks. Reports on a general investigation of wildlife in national parks with emphasis on the effects of man. Many individual accounts of the effects of park visitors on different species of birds and mammals. Emphasis on humans making adjustments rather than the animals.

KEYWORDS: Wildlife, national parks.

41. Wright, G. M., and B. H. Thompson.

1934. Fauna of the National Parks of the U.S. Fauna Series No. 2. U.S. Govt. Print. Off., 142 p. Washington, D.C.

Emphasizes the joint occupation of wildlife and man in national parks in primitive or wild settings. Includes examples of wildlife (osprey, cranes, geese, pelican, beaver, and moose) in wilderness-type situations living in close contact with man, encouraged by the exercise of restraint on man's part.

KEYWORDS: Wildlife, habituation, national parks.

HUMAN IMPACTS ON SPECIFIC SPECIES

General Wildlife

(Also see reference numbers 212, 224-231; also see wildlife in keywords)

42. Hornocker, M.

1978. Interactions between threatened and endangered species and wilderness. Trans. North Am. Wildl. and Nat. Resour. Conf. 43:344-350.

Wilderness is a natural laboratory that can provide the baseline data against which man's impact on wildlife, especially endangered species can be measured.

KEYWORDS: Endangered species, human impact, wilderness.

43. Dixon, J. S.

1938. Birds and mammals of Mount McKinley National Park. Fauna of the National Parks of the U. S. Fauna Series No. 3. U.S. Govt. Print. Off., 236 p. Washington, D.C.

Numerous accounts of reactions of various wildlife species to man recorded during the field work for this publication.

KEYWORDS: Wildlife, Mount McKinley National Park.

Insects

44. Mahoney, C. L.

1976. Soil insects as indicators of use patterns in recreation areas. J. For. 74(1):35-37.

Population densities of *Collembola* may be useful indicators of intensity of use in campgrounds. Reduction in numbers of individuals and species was related to more intensive campground use.

KEYWORDS: Soil insects, campgrounds, Colorado.

Reptiles

(Also see reference numbers 3, 18, 27, 28, 226, 232, and the keyword desert animals)

45. Bury, R. B., and B. W. Marlow.

1973. The desert tortoise. Will it survive? Natl. Parks Conserv. Mag. 47(6):9-12.

Discusses the severity of the direct impact of modern man on desert tortoise populations as well as man's impact on desert tortoise habitat.

KEYWORDS: Desert tortoise, human impact.

Birds

(Also see reference numbers 9, 13, 15, 22, 27, 28, 37, 185, 187, 216, and the keyword desert animals)

46. McIntyre, J. M. W.

1975. Biology and behavior of the common loon (*Gavia immer*) with reference to its adaptability in a man-altered environment. Ph.D. dissertation. Univ. Minn., Minneapolis. 243 p.

Discusses the impact of increased recreational use of lakes on loons. The annual biology of loons was studied to assess their ability to adapt.

KEYWORDS: Common loon, water recreation, Minnesota.

47. McIntyre, J. M. W.

1977. Spring calls the loons. Minn. Volunteer Mar.-Apr.: 22-26.

Recreationists too close to loon nests cause adult birds to sneak off nests and leave eggs vulnerable to predators. Newly hatched chicks are also vulnerable to predation when parent birds are frightened away. Suggests recreationists move away from obviously agitated loons.

KEYWORDS: Common loon, water recreation.

48. Ream, C. H.

1976. Loon productivity, human disturbance, and pesticide residues in northern Minnesota. Wilson Bull. 88(3):427-432.

Increasing use of loon nesting islands by canoeists for camping appears to be primary cause of decrease in loon productivity in the Boundary Waters Canoe Area. Pesticide residues are a potential danger on some lakes.

KEYWORDS: Common loon, water recreation, pesticides, Boundary Waters Canoe Area, Minnesota.

49. Thompson, B. H.

1936. The problem of vanishing species-the trumpeter swan. North Am. Wildl. Conf. 1:639-641.

Discusses the causes of mortality of the trumpeter swan. Cites instance where fishermen disturbed nesting pair at an isolated lake so that they failed to hatch cygnets.

KEYWORDS: Trumpeter swan, human disturbance, Montana, Wyoming.

50. Kuchel, C. R.

1977. Some aspects of the behavior and ecology of harlequin ducks breeding in Glacier National Park. M.S. thesis. Univ. Mont., Missoula 147 p.

Harlequin ducks require pristine stream ecosystems and relative seclusion from human interference for successful breeding. Alteration of stream courses, contamination by human sewage, siltation from construction, and clearing stream channels of fallen trees are discouraged.

KEYWORDS: Harlequin ducks, wildlife management, Glacier National Park.

51. Ames, P. L., and G. S. Mersereau.

1964. Some factors in the decline of the osprey in Connecticut. Auk 81:173-185.

Reports effects of human disturbance on osprey nesting. Nests were deserted because picnickers repeatedly kept birds from incubating. Eggs were broken by ospreys flushing from ground nests when frightened by speeding motorboats. Nevertheless, human activity was not considered a major factor in hatching failure. Reproductive success of remotely located nests was lower than from nests more exposed to human activity.

KEYWORDS: Osprey, water recreation, Connecticut.

52. Dunstan, T. C.

1968. Breeding success of osprey in Minnesota from 1963 to 1968. Loon 40:109-112.

In Minnesota, perhaps due to increased travel by watercraft, ospreys seem to be building nest farther from lake and river shores. Osprey eggs may be chilled or overheated when people frighten incubating adults from the nests.

KEYWORDS: Osprey, water recreation, Minnesota.

53. Dunstan, T. C.

1973. The biology of ospreys in Minnesota. Loon 45:108-113.

Reports osprey nest failure due to human disturbance. Notes a trend for change in nest location away from lakes used by osprey for fishing. Suggests increase of recreational use of these areas may be responsible.

KEYWORDS: Osprey, water recreation, Minnesota.

54. Elrod, M. J.

1897. The American osprey in the Yellowstone National Park. Osprey 1:143.

Ospreys nesting in the Grand Canyon of Yellowstone were not noticeably disturbed by tourists on the rim.

KEYWORDS: Osprey, Yellowstone National Park.

55. French, J. M.

1972. Distribution, abundance, and breeding status of ospreys in northwestern California. M.S. thesis Humboldt State Univ., Arcata, Calif. 58 p.

Found very low level of significance in the differences of osprey nest failure associated with four levels of magnitude of human disturbance. Some ospreys abandoned nests possibly due to disturbance while others successfully raised young in spite of disturbance. Section on management implications.

KEYWORDS: Osprey, human disturbance, wildlife management, California.

56. Garber, D. P.

1972. Osprey nesting ecology in Lassen and Plumas Counties, California. M.S. thesis. Humboldt State Univ., Arcata, Calif. 59 p.

Section on human disturbance of nesting birds. Thirty-three percent of egg loss in study area attributed to human disturbance. Human disturbance may also cause premature flight of young osprey resulting in injury and predation. Major causes of reproductive failure were the destruction of nests by winds and the breakage of eggs in nests. Eggshell thinning resulting from metabolites of DDT was implicated.

KEYWORDS: Osprey, human disturbance, pesticides, California.

57. MacCarter, D. L.

1972. Reproductive performance and population trends of ospreys at Flathead Lake, Montana. M.S. thesis. Humboldt State Univ., Arcata, Calif. 80 p.

Effects of human disturbance on osprey populations in Montana study area minimal. Osprey on Flathead Lake are almost through incubation by the time summer visitors arrive in mid-June. Removal of snags, which have potential as nesting sites, may affect breeding population. The most important factor in lowered reproductive performance was thought to be DDT contamination of the eggs. Gives evidence that ospreys can adapt to nesting in populated areas if people are interested in protecting the birds.

KEYWORDS: Osprey, human impacts, habituation, pesticides, Montana.

58. Reese, J. G.

1970. Reproduction in a Chesapeake Bay osprey population. Auk 87:747-759.

Major cause of nest loss in study area was due to the efforts of the U.S. Coast Guard to keep navigation aids (which were being used as nesting platforms by osprey) unobstructed.

KEYWORDS: Osprey, human impacts, Chesapeake Bay.

59. Reese, J. G.

1972. Osprey nesting success along the Choptank River, Maryland. Chesapeake Sci. 13:233-235.

Birds nesting on offshore channel markers and duck blinds are disturbed by increasing numbers of visitors in boats. Considers that increasing human disturbance has an adverse effect on osprey reproduction. Nests on channel markers are destroyed by the U.S. Coast Guard.

KEYWORDS: Osprey, water recreation, Maryland.

60. Rhodes, L. I.

1972. Success of osprey nest structures at Martin National Wildlife Refuge. J. Wildl. Manage. 36:1296-1299.

Speculates that lack of human disturbance and relative lack of chemical pollutants may be the reasons for the success of platform-nesting ospreys on Martin refuge in Chesapeake Bay.

KEYWORDS: Osprey, Chesapeake Bay.

61. Schmidt, F. C.

1966. The status of the osprey in Cape May County, New Jersey between 1939 and 1963. Chesapeake Sci. 7:220-223.

Suggested reasons for the long term nature of osprey decline are: increasing frequency of human disturbance and nest destruction, diminishing food supply, and increasing concentrations of industrial contaminants in the food chain.

KEYWORDS: Osprey, human impacts, New Jersey.

62. Schroeder, G. J.

1972. Results of a two year investigation of the ospreys of northern Idaho. M.S. thesis. Univ. Idaho, Moscow. 63 p.

Effects of human disturbance on osprey in Idaho study area are considered to be minimal; however, examples of shooting ospreys and nesting disturbance by humans are cited.

KEYWORDS: Osprey, human disturbance, Idaho.

63. Grier, J. W.

1969. Bald eagle behavior and productivity responses to climbing to nests. J. Wildl. Manage. 33:961-966.

Single climbs by researchers into bald eagle nests containing 2- to 11-week-old young had no measurable effect on subsequent productivity.

KEYWORDS: Bald eagle, human disturbance.

64. Juenemann, B. G.

1973. Habitat evaluations of selected bald eagle nest sites on the Chippewa National Forest. M.S. thesis. Univ. Minn., St. Paul. 170 p.

Describes effects of human disturbance on bald eagle nesting activity.

KEYWORDS: Bald eagle, human disturbance.

65. Mathisen, J. E.

1968. Effects of human disturbance on nesting bald eagles. J. Wildl. Manage. 32(1):1-6.

Human disturbance on the Chippewa National Forest, Minnesota, was not considered to cause nesting failure of eagles; however, disturbance earlier in incubation might have an effect.

KEYWORDS: Bald eagles, human disturbance, Minnesota.

66. Mathisen, J. E., D. J. Sorenson, L. D. Frenzel, and T. C. Dunstan.

1977. Management strategy for bald eagles. Trans. North Am. Wildl. and Natl. Resour. Conf. 42:86-92.

Bald eagle nest protection on the Chippewa National Forest, Minnesota, proved to be inadequate prior to 1974. Implementation of eagle nest protection included requirement of detailed management plan for forest areas in which nests occur, improved buffer zone specifications, and taking into account the known responses of particular eagle pairs to various types of human intrusion. The security of nesting birds was improved by closing some areas, seasonal restrictions, and rerouting of travelways.

KEYWORDS: Bald eagles, wildlife management, Minnesota.

67. Murphy, J. R.

1960. Ecology of the bald eagle in Yellowstone National Park: Progress report summer of 1960. Unpubl. rep., Yellowstone National Park, Wyo. 6 p.

One factor in nest site selection by eagles in Yellowstone was freedom from disturbance. Cites specific examples for eagles nesting in Yellowstone.

KEYWORDS: Bald eagle, human disturbance, Yellowstone National Park.

68. Nature Conservancy.

1976. Skagit eagles: a management program for the Skagit River Bald Eagle Natural Area. The Nature Conservancy, Portland, Oreg. 52 p.

A population of 100-200 bald eagles winter on the upper Skagit River. Wintering eagles and the salmon on which they feed have shown a long term decline. Decline of eagles was attributed to habitat elimination and loss of solitude at nesting areas due to increased use of these areas by man, pesticide contamination, shooting, and poisoning of eagles. Critical habitat along a 7-mile stretch of the Skagit River has been acquired for public trust ownership and designated as the Skagit River Bald Eagle Natural Area. Management recommendations for this area are to enhance eagle viewing while still providing maximum possible protection of the eagles. From late April to early October, when eagles are not present, many forms of outdoor recreation are permitted. During the winter, general outdoor recreation is not permitted. Bank fishing is not allowed.

KEYWORDS: Bald eagle, winter, human impact, wildlife management.

69. Servheen, C. W.

1975. Ecology of the wintering bald eagles on the Skagit River, Washington. M.S. thesis. Univ. Wash., Seattle. 96 p.

The decline in bald eagle populations is attributed to habitat destruction, shooting and poisoning, loss of solitude at nesting areas, and pesticide contamination. Wintering eagles in the study area preferred areas where food was abundant and there was the least amount of human disturbance. The author feels that with proper regulation of land use, fishermen, recreationists, and birdwatchers can co-exist with eagles. Management suggestions include maintenance of natural spawning salmon populations, and restriction of boat landing and development along specific sections of the river.

KEYWORDS: Bald eagle, winter, human impact, recreation management, wildlife management, Washington.

70. Shay, D. S.

1973. A management-oriented study of bald eagle concentrations in Glacier National Park. M.S. thesis. Univ. Mont., Missoula. 78 p.

Greatest danger to bald eagles in Glacier National Park is the disruption caused by eagle-watchers. The author recommends: Protecting eagle roosting and nesting areas from human disturbance, maintaining a policy of no salmon snagging or boating on McDonald Creek from October 15 to December 15 (except for eagle census), prohibiting snowmobile use on trail near McDonald Creek, and a better eagle-viewing and education program.

KEYWORDS: Bald eagle, winter, birdwatchers, recreation management, Glacier National Park.

71. Sprunt, A.

1969. Population trends of the bald eagle in North America. In *Peregrine falcon populations: their biology and decline*. p. 347-351. J. J. Hickey, ed. Univ. Wis. Press, Madison. 596 p.

Decline in bald eagle populations attributed to human disturbance, habitat loss, shooting, and other undetermined factors.

KEYWORDS: Bald eagle, human impact.

72. Stalmaster, M. V.

1976. Winter ecology and effects of human activity on bald eagles in the Nooksack River valley, Washington. M.S. thesis. West. Wash. Univ., Bellingham. 100 p.

Evaluates the effects of human presence and activities on the behavior of wintering eagles. The most disruptive human activity is drift and motor boating, second is recreational viewing of eagles, and third is shore and river fishing. Concludes that Nooksack River eagle population is threatened by human interference. Management recommendations include protection of eagle population and salmon spawning grounds, use of vegetative buffer zones, prohibition of boating along prime feeding areas, restriction of logging practices along wintering grounds, construction of interpretive displays for visitor information, and a 300-meter activity-restriction zone.

KEYWORDS: Bald eagle, winter, human disturbance, recreation management, wildlife management, Washington.

73. Stalmaster, M. V., and J. R. Newman.

1978. Behavioral responses of wintering bald eagles to human activity. *J. Wildl. Manage.* 42(3):506-513.

The authors found that wintering bald eagles moved to areas of lesser human activity. Older birds were more sensitive to disturbance than younger ones. Eagles reacted the most to disturbances which occurred in the water and on gravel bars, and less to land disturbances, especially when vegetation partially obscured visibility. Eagles seemed to habituate to normal activities. Recommends reduced human interference, activity restriction zones, and vegetation buffer zones for bald eagle wintering grounds.

KEYWORDS: Bald eagles, winter, human disturbance, habituation, recreation management, Washington.

74. Swenson, J. E.

1975. Ecology of the bald eagle and osprey in Yellowstone National Park. M.S. thesis. Mont. State Univ., Bozeman. 146 p.

Found definite effects of human activities on osprey reproduction. Bald eagles are quite tolerant of human presence during late incubation and after hatching but disturbance during initiation of nesting could be disruptive. Presence of fishermen had no influence on osprey foraging. Management suggestions made.

KEYWORDS: Bald eagle, osprey, wildlife management, human disturbance, Yellowstone National Park.

75. Windsor, J.

1975. The response of peregrine falcons (*Falco peregrinus*) to aircraft and human disturbance. Can. Wildl. Serv., Edmonton. 87 p. [Draft prepared for the Environmental Social Program, Northern Pipeline]

Discusses effects of hikers and aircraft on peregrine falcons. Peregrine can dislodge eggs and young from nests when suddenly flushed by a person, aircraft or predator. Management recommendations include: aircraft should maintain altitudes of 750 m above sea level and hiking trails should not be closer than 1 500 m from the aerie, with a minimum of 800 m if trail is not visible from the nest.

KEYWORDS: Peregrine falcon, aircraft, trail impact, wildlife management.

76. Sowl, L. W., and J. C. Bartonek.

1974. Seabirds-Alaska's most neglected resource. Trans. North Am. Wildl. Nat. Resour. Conf. 39:117-126.

At the approach of man, cliff nesting seabirds flush, and may cause eggs and young to fall and be destroyed.

KEYWORDS: Seabirds, human disturbance, Alaska.

77. Hunt, G. L., Jr.

1972. Influence of food distribution and human disturbance on the reproductive success of herring gulls. Ecology 53:1051-1061.

Hatching success of Maine herring gull colonies that were visited by picnickers was significantly lower than those that were not. Mortality was attributed to embryonic overheating while parents were off eggs as a result of human disturbance.

KEYWORDS: Herring gull, human disturbance, Maine.

78. Gochfeld, M.

1978. Terns in traffic. Nat. Hist. 87(6):54-61.

Reports history of tern nesting colonies in New York as affected by man. Describes interactions of common terns and people on New York beaches. Terns can nest successfully near intensively used beaches if they are not harassed, stomped on, or run over by cars.

KEYWORDS: Common tern, harassment, New York.

Bats

79. Humprey, S. R.

1978. Status, winter habitat and management of the endangered Indiana bat, *Myotis sodalis*. Fla. Sci. 41(2):65-76.

Populations of the Indiana bat are declining, due in part to disturbance by biologists and caving enthusiasts. Winter disturbance of bats causes them to utilize fat reserves needed to survive the winter. Structures built at cave entrances may restrict air movements making the temperature of bat roosts too warm for survival of hibernating bats because of resulting increased metabolism of fat reserves. Recommends replacing structures closing entrances to cave with strong gates which would restrict visitor access, yet allow free air circulation and access by bats. Also recommends not more than one winter visit to each hibernaculum.

KEYWORDS: Indiana bat, winter, human disturbance, wildlife management.

80. Petit, M. G.

1978. The imperiled bats of Eagle Creek Cave. Nat. Hist. 87(3):50-55.

A maternity colony of Mexican free-tailed bats is decreasing about 10 percent each year at Eagle Creek Cave. Pesticides are considered to be the primary cause of this decline. People shooting into the cave cause additional mortality due to stress. To save these bats the maternity colonies need protection and the use of fat soluble pesticides in the foraging area needs to be restricted.

KEYWORDS: Mexican free-tailed bat, pesticides, human disturbance, Arizona.

Rodents

(See reference numbers 3, 5, 8, 18, 19, 27, 28)

Cetaceans (Whales)

(Also see reference number 17)

81. Payne, R.

1979. Humpbacks: their mysterious songs. Nat. Geogr. 155(1):18-25.

In Hawaii, whales are being harassed on their breeding grounds by well-meaning tourists in small boats who want to see and photograph the whales. An official organization has been formed to educate the public and thus prevent harassment.

KEYWORDS: Humpback whales, harassment, education, Hawaii.

Carnivores

Wolves, Coyotes, Foxes

(Also see reference numbers 4, 19, 31, 154)

82. Chapman, R. C.

1977. The effects of human disturbance on wolves (*Canis lupus* L.) M.S. thesis Univ. Alaska, Fairbanks. 209 p.

Wolves responded to humans near pups by barking or howling, leaving the area, or moving the pups. Low intensity disturbance does not seem to cause significant pup mortality. Recommends closing areas of 2.4 km radius around homesites to disturbance from 4 or 5 weeks before whelping until wolves leave the area. Contains appendix of more than 100 published and unpublished accounts of wolf reactions to disturbance. Source for additional accounts of wolf/man interactions.

KEYWORDS: Wolves, human disturbance, wildlife management, bibliography.

83. Grace, E. S.

1976. Interactions between men and wolves at an arctic outpost on Ellesmere Island. Can. Field-Nat. 90(2):149-156.

Reports records of wolf-man interactions from early years at the arctic weather station and compares them with present wolf behavior. Wolves generally avoided humans and domestic dogs. Most wolves were seen at or near settlement dump. Due to the negative effects of dumps on wolf behavior and ecology, the author suggests garbage be incinerated or fenced off.

KEYWORDS: Wolves, wildlife management, Ellesmere Island, Canada.

84. Mech, L. D.

1966. The wolves of Isle Royale. Fauna of the National Parks of the U.S. Fauna Series No. 7. U.S. Govt. Print. Off., Washington, D.C. 210 p.

Gives occasional insights into the responses of wolves to the researcher on the ground, and to the aircraft used for observations. The researcher was not threatened by wolves, even when he examined recent kills. The wolves became habituated to the airplane used for observations and usually did not run even when repeatedly buzzed as low as 40 feet.

KEYWORDS: Wolves, aircraft, Isle Royale National Park.

85. Murie, A.

1944. The wolves of Mount McKinley. Fauna of the National Parks of the U.S. Fauna Series No. 5. U.S. Govt. Print. Off., Washington, D.C. 238 p.

Occasional insights into the response of Mount McKinley wildlife to the author. Also includes information on behavior of captive wolves.

KEYWORDS: Wolves, dall sheep, Mount McKinley National Park.

86. Peterson, R. O.

1977. Management implication of wolf-moose research, Isle Royale National Park, Mich. Rep. to the Natl. Park Serv. 14 p.

Wolves of Isle Royale tend to avoid contact with humans. Wolf use of park trails declines after visitors arrive in the spring. Selection of den and rendezvous sites indicates pronounced avoidance of humans. Management suggestions include limiting visitation, enlarging existing backcountry campsites rather than establishing new campgrounds, no further trail development, and discouragement of winter visitor use.

KEYWORDS: Wolves, human disturbance, winter, recreation management, Isle Royale National Park.

Bears

(Also see reference numbers 4, 19, 31, 154, 195, 210)

87. Jonkel, C.

Bear bibliography. Univ. Mont., Sch. For., Missoula, Unpubl.

Bibliography collected by Border Grizzly Project.

KEYWORDS: Bears.

88. Marsh, J.

1970. Bears and the public in our national parks. Can. Audobon 32(2):43-45.

Interviewed visitors to determine attitudes about bears. Suggests safer human behavior and a more realistic assessment of bear hazards to reduce bear-man conflicts in parks.

KEYWORDS: Bear, danger, human attitudes, Canadian national parks.

89. Merrill, E. H.

1978. Factors affecting depredations on backcountry campgrounds by bears in Glacier National Park. Wildl. Soc. Bull. 6(3):123-126.

"Ecological and human-use parameters of 56 backcountry campgrounds in Glacier National Park were measured to determine factors which predispose these sites to black bear (*Ursus americanus*) and grizzly bear (*U. arctos*) depredation. Examination of 50 bear incidents indicated that an unexpectedly high number of bear incidents occurred in deteriorated campgrounds in mature forest which were within 5 km of a developed area, and which had large party limits and good fishing nearby. Changes in present campground management are recommended to minimize bear-human conflicts." Recommendations include: Locating campgrounds away from lake shores, major trail systems, and developed areas; and intensive education about backcountry etiquette, especially garbage disposal.

KEYWORDS: Black bear, grizzly bear, campgrounds, recreation management, Glacier National Park.

90. Steinhart, P.

1978. Getting to know bruin better. Natl. Wildl. 16(5):20-27.

Popular review of current bear research. Quotes biologists who feel that bears in national parks expect to eat visitors' food, and behave differently than bears in national forests. One bear biologist quoted believes the Yosemite bear population, especially in the high country, is unnaturally high because of the food obtained from backpackers.

KEYWORDS: Black bear, backpackers.

91. East, B.

1978. Disneybeast or mankiller? Outdoor Life 162(4):81-83, 168, 170, 172, 174.

Recites numerous accounts of black bears attacking man and, in some cases, eating the victims. Considers all bears, including male black bears, to be unpredictable and potentially dangerous. Suggests rekindling the fear of man in bears by regulated hunting.

KEYWORDS: Black bear, danger.

92. Gorsline, T.

1978. Maneating black bear! Outdoor Life 162(2):88, 100, 102, 104, 106, 108.

Account of black bear killing and eating three boys. Quotes biologists who believe that as the number of man-bear contacts increase in areas like national parks where bears are protected, bears will lose their fear of man and regard nonviolent man as a source of food.

KEYWORDS: Black bear, danger, Algonquin Park, Ontario.

93. Harms, D. R.

[In Press]. Black bear management in Yosemite National Park. 4th Int. Cong. on Bear Research and Management, Feb. 21-24, 1977. Kalispell, Mont.

Management program to prevent man-bear interactions, includes: public information and education, removal of artificial food sources, enforcement of regulations for feeding and food storage, control of problem bears, and monitoring of bear-human relationships.

KEYWORDS: Black bear, recreation management, Yosemite National Park.

94. Laycock, G.
1977. Everybody's favorite bear. Audubon 79(3):6-19.

Popular article on black bears which includes many stories of man-bear interactions from all over the United States.

KEYWORDS: Black bear.

95. Singer, F. J.
[In Press]. Black bear management in Great Smoky Mountains National Park. 4th Int. Conf. on Bear Research and Management. Feb. 21-24, 1977. Kalispell, Mont.

Bear management from 1964-1976 discussed. Bear incidents in Great Smoky Mountain National Park are correlated with habitat, physical features, visitor use, food storage, garbage storage, etc. Review of pertinent black bear research and management. (See Singer and Bratton 1976.)

KEYWORDS: Black bear, recreation management, wildlife management, Great Smoky Mountains National Park.

96. Singer, F. J., and S. P. Bratton.
1976. Black bear management in Great Smoky Mountains National Park. Uplands Field Res. Lab., Manage. Rep. 13. 34 p.

A review of black bear management in the Great Smoky Mountains National Park from 1964 to 1976. Most human injuries were associated with violations of Park Service regulations, particularly feeding of bears. Sows with cubs incurred the most injuries. Property damage caused by bears was predominantly in front country before 1973, but shifted to primarily back country after 1973, following a major increase in overnight backcountry use since 1970. Black bear damage incidents were positively correlated with the number of visitor nights at a backcountry site.

KEYWORDS: Black bear, wildlife management, Great Smoky Mountains National Park.

97. Whittaker, P. L.
1977. Black bear management in Great Smoky Mountains National Park. Rep. to the Superintendent, Great Smoky Mountains National Park. 14 p.

Describes bear incidents in Great Smoky Mountains National Park and management actions for the year 1977. The only management response to backcountry incidents was campsite closure. Problem bears near roads were translocated. Lithium chloride (LiCl_2) was fed to roadside bears to attempt to discourage roadside feeding by bears. It was unsuccessful. Improper food storage was the cause of most campground incidents.

KEYWORDS: Black bear, wildlife management, recreation management, Great Smoky Mountains National Park.

98. Bach, E., Jr.
1978. Backpacking in grizzly country. Backpacker 25:45-46, 66-68.

Lists precautions to be taken while backpacking in grizzly country. The author suggests that, to reduce risk, hikers learn about grizzly behavior, be alert, and avoid areas obviously used by bears; make their presence known; never hike alone; stay away from carrion; pick a good campsite and keep it free of food; and avoid all cosmetics; leave pets at home; give bears plenty of room; and stay cool in case of confrontation. Menstruating women should stay out of grizzly country.

KEYWORDS: Grizzly bear, backpackers, recreation management.

99. Chester, J. M.

[In Press]. Factors influencing human-grizzly bear interactions in a backcountry setting. 4th Int. Conf. on Bear Research and Management, Feb. 21-24, 1977, Kalispell, Mont.

Seven species of wildlife including grizzly bears were studied for their interactions with humans in backcountry areas of Yellowstone National Park. Describes seasonal bear movements and human-bear encounter frequencies for on-trail travel and off-trail travel. Off-trail hikers were 3 to 4 times more likely to see grizzlies than people using trails. The greatest number of bear observations occurred during periods when bears were at low elevations.

KEYWORDS: Wildlife, grizzly bear, trail impacts, Yellowstone National Park.

100. Cole, G. F.

1974. Management involving grizzly bears and humans in Yellowstone National Park. Bioscience 24(1):1-11.

Describes management of bears and people in Yellowstone, which author felt reduced hazards "without deterring either grizzly reproduction or all human satisfactions."

KEYWORDS: Grizzly bear, wildlife management, recreation management, Yellowstone National Park.

101. Elmork, K.

1978. Human impact on the brown bear population (*Ursus arctos* L.). Biol. Conserv. 13:81-103.

The effects of human disturbance and activities on a remnant brown bear population in southern Norway was studied for 25 years. Negative correlations were noted between the number of bear observations and the density of roads. Fewer bears were observed in areas close to clusters of holiday cabins.

KEYWORDS: Brown bear, human impacts, Norway.

102. Faro, J., and S. Eide.

1974. Management of McNeil River State Game Sanctuary for nonconsumptive use of Alaska brown bears. In Proc. 54th Annu. Conf. Western Assoc. State Game and Fish Comm., p. 113-118. [Albuquerque, N. M., July 16-19, 1974.]

Increasing numbers of photographers at McNeil River Falls, Alaska, caused brown bears to modify the time and location of their fishing activities to avoid people. Unrestricted public use was incompatible with the intended purposes of the sanctuary and a limited permit system was initiated to regulate numbers of visitors during periods of bear concentrations.

KEYWORDS: Brown bears, photographers, recreation management, Alaska.

103. Frome, M.

1978. Teach people to respect bears. High Country News, Aug. 25, 1978. [Reprinted from Los Angeles Times.]

Expresses opinion that the federal government is not responsible for accidents occurring in national parks and wilderness areas, in particular injuries from grizzly bears. This means teaching people to respect bears and limiting or controlling human activity in bear country. The author feels that grizzlies and wilderness recreation are compatible.

KEYWORDS: Grizzly bears, recreation management.

104. Gilbert, B.

1976. The great grizzly controversy. Audubon 78(1):62-92.

Summarizes history of grizzly bear interactions with man from first white settlers to the present, including the Yellowstone Park bear management controversy. Suggests establishing and managing some pieces of public land where grizzly take precedence over all other interests.

KEYWORDS: Grizzly bear, wildlife management.

105. Herrero, S.

1970. Human injury inflicted by grizzly bears. Science 170:593-598.

Examines instances of human injury by bears in parks and makes suggestions on ways to minimize injuries. Notes that the public favors more effective management of people garbage, and bears.

KEYWORDS: Grizzly bear, danger, recreation management, wildlife management.

106. Herrero, S.

1970. Man and the grizzly bear (present, past, but future?). Bioscience 20(21):1148-1153.

Substantiates belief that grizzly bears and man can coexist in certain areas and that this coexistence is especially valuable in Glacier and Yellowstone National Parks. This coexistence is dependent on the behavior of people in these parks.

KEYWORDS: Grizzly bear, recreation management, Glacier National Park, Yellowstone National Park.

107. Herrero, S.

1978. The grizzly bear "stopper"--a feasible technology? Bear Biol. Assoc. 78(2):4-5.

Discusses a possible grizzly attractant that would hold bear's attention while the victim sneaks off, and grizzly "stoppers" such as electrical stun guns, knockout drugs, or Mace. Points out the dangers in these possibilities, and suggests the alternatives of: control of human use in prime grizzly habitat, education of recreationists concerning grizzly ecology and behavior, and acceptance of the fact that a few people will be injured by grizzlies each year.

KEYWORDS: Grizzly bear, wildlife management, recreation management.

108. Johnson, A. S.

1972. Man, grizzly and national parks. Natl. Parks Conserv. Mag. 46(2):10-15.

Article prompted by August 13, 1967, deaths of two girls in Glacier National Park. Traces man-bear interaction from Indians forward. Gives history of man's interaction with bears in Yellowstone National Park. Concludes the bear problem is tied to environmental pollution. Garbage-eating bears have lost fear of man in national parks. Describes National Park Service program to eliminate artificial foods from bears' diet. The goals are wild, independent populations of black and grizzly bears, greater safety for park visitors, and destruction of fewer bears.

KEYWORDS: Grizzly bear, recreation management, Yellowstone National Park.

109. Jonkel, C.

1977a. Clearcut logging, Cabin Creek, and the grizzly bear in southeastern British Columbia. Border Grizzly Project. Spe. Rep. 11, 11 p.

Grizzly is being detrimentally affected by: increased bear-man encounters, loss of habitat, and deterioration of natural bear behavior toward man. Management suggestions include carefully controlled minimum development, protection of important habitat, road closures, improving public knowledge, and attitude about bears.

KEYWORDS: Grizzly bear, human impact, wildlife management, recreation management, British Columbia, Montana.

110. Jonkel, C.

1977b. Living with grizzlies. Proc., Second Symp. on Endangered North Am. Species and Habitat. p. 133-137. [St. Louis, June 1-5, 1977.]

Ranchers and local people have coexisted with grizzlies in Montana. Grizzlies are now threatened by: recent demands on resources from oil, gas and coal developments, subdivisions, pulp operations, ski developments, and recreationists with little knowledge of bears. Expresses need for more data on grizzly biology. Urges continued coexistence of grizzlies and man in Montana.

KEYWORDS: Grizzly bear, human impact, coexistence.

111. Jonkel, C., and C. Servheen.

1977. Bears and people. West. Wildl. 4(2):22-25.

Examples of successful coexistence of grizzlies with people. Suggest minimizing bear-people confrontations by restricting people in key areas of grizzly range when bears are using these areas and locating trails and camps away from these areas. Rules for backcountry users include: pack out garbage, cook and hang food away from sleeping areas, keep camp free of food debris, do not camp close to areas used by bears, stay alert on trails, learn about bear behavior, and do not take a dog with you unless it is trained to serve as an "early warning system." In case of an attack: climb a tree, drop a pack or coat as distraction and move away, play dead, or if all else fails, fight.

KEYWORDS: Grizzly bear, coexistence, recreation management.

112. Jonkel, C., and N. McMurray.

1978. The Pacific Northwest Trail and grizzly bears. Border Grizzly Proj. Spec. Rep. 15, 6 p.

Recommendations for trail construction and management and behavior of users to reduce potential man-grizzly conflicts on the Pacific Northwest Trail. Guidelines could be applied elsewhere. Recommends that the trail avoid prime and precarious grizzly range with trail closures during critical seasons, and trail closures if: an animal carcass is near a trail, a female grizzly with cubs has been seen, or a grizzly with unusual behavior toward people is sighted. Generally the route of the trail and camping should occur away from areas normally used by grizzlies. Recommends rules for trail users, as in Jonkel and Servheen (1977).

KEYWORDS: Grizzly bear, trail impacts, recreation management.

113. Martinka, C. J.

1974. Preserving the natural status of grizzlies in Glacier National Park. Wildl. Soc. Bull. 2(1):13-17.

Reports on an integrated program of visitor information and travel restrictions. Removal of unnatural food and bear control was accompanied by fewer injuries (0.2/1,000,000 visitors) and bear-caused deaths (1.0/year) than in previous years. Current and future relationships between grizzlies, park visitors, and management programs are discussed.

KEYWORDS: Grizzly bear, recreation management, Glacier National Park.

114. Momen, G. B.

1968. Bears: The need for a new sanity in wildlife conservation. *Bioscience* 18(2):1105-1108.

Notes that bears interact with park visitors who are sightseeing, hiking, photographing, etc. Reviews injuries and deaths to humans by bears. Suggests that, because grizzlies are dangerous to people, we are under no moral obligation to maintain this species in the national parks.

KEYWORDS: Grizzly bear, danger, national parks.

115. Mundy, K. R. D., and D. R. Flook.

1973. Background for managing grizzly bears in the national parks of Canada. *Can. Wildl. Serv. Rep. Ser.* 22, 35 p.

Ecology of grizzly bears in Canadian parks is presented. Incidents of threats and attacks on man in parks are described. Factors associated with bear belligerence include: surprising a bear at close range; approaching a bear in possession of a carcass, females with young, or wounded bears; and bears habituated to associate man with food or garbage. Management recommendations include: installing garbage incinerators away from human habitation centers; installing "bear-proof" garbage bins; picking up garbage every evening; issuing plastic bags to trail users to pack out unburned garbage; locating campgrounds outside of favored grizzly habitat; informing the public about bears; restricting dogs; and advising hikers to make noise and avoid areas occupied by grizzlies.

KEYWORDS: Grizzly bear, danger, recreation management, Canadian national parks.

116. Riegelhuth, R.

1966. Grizzly bears and human visitation. M.S. thesis. Colo. State Univ., Ft. Collins. 80 p.

Roadless area nonhunting recreation at 1966 levels did not affect the well being of grizzly bear populations. With the exception of garbage dumps, grizzly use of visitor concentration sites did not increase as the numbers of visitors increased. Wildland units larger than 1,000 square miles were much better for maintaining grizzly numbers than smaller areas. Incidence of unprovoked grizzly attack on nonhunting recreationists was very rare.

KEYWORDS: Grizzly bear, recreation.

117. Russell, A.

1967. Grizzly country. 302 p. Alfred A. Knopf, New York.

A wilderness adventure book that includes stories about many grizzly-man interactions in the Canadian Rockies. Good information on the scope of potential grizzly behavior.

KEYWORDS: Grizzly bear, Canada.

118. Russell, A.

1968. The people vs. the grizzlies. *Field and Stream* 62(11):60-61, 113-119, 151.

Review of grizzly bear attacks on two girls in Glacier National Park in 1967. Russell believes that grizzlies and people can coexist compatibly if the bears have not been conditioned to feed on garbage.

KEYWORDS: Grizzly bear, danger, coexistence.

119. Schallenberger, A.

[In Press]. Review of oil and gas exploitation impacts on grizzly bears. 4th Int. Conf. on Bear Research and Management, Feb. 21-24, 1977. Kalispell, Mont.

Present conflicts with grizzly need to be determined before gas and oil exploration begins. The greatest impacts appear to be the construction of roads in previously unroaded areas and the increased use of land by people. Suggests restrictions in development until adequate grizzly management data are available.

KEYWORDS: Grizzly bear, human impact, Montana.

120. Schneider, B.

1977. Where the grizzly walks. 191 p. Mountain Press Publishing, Missoula, Mont.

Concerned with history of the relationship of the grizzly bear with man and how this affects the future of the bear. Emphasizes the effects of development on the bear and what needs to be done to control development on grizzly habitat.

KEYWORDS: Grizzly bear, human impacts.

121. Servheen, C. W.

1978. The grizzly bear in the Rattlesnake Mountains. In Annual report border grizzly project. p. 3-15. C. Jonkel. School of For., Univ. Mont. 256 p. Missoula.

Contains section on management of recreation in grizzly habitat in the Rattlesnake drainage in Montana, with the objective of positive benefits to both bear and man. Suggests that if recreational use of high country increases it may be necessary to close trails or lakes frequently used by a grizzly, limit camping to certain areas, relocate trails and campgrounds, limit use of some areas during certain seasons, and provide bear country camping instructions at trail heads.

KEYWORDS: Grizzly bear, recreation management, trail impacts.

122. Stuart, T. W.

[In Press]. Exploration of optimal backcountry travel patterns in grizzly bear habitat. 4th Int. Conf. on Bear Research and Management. Feb. 21-24, 1977. Kalispell, Mont.

Parametric linear programming was used to quantify trade-offs among five management objectives: three measures of trail-related contact between grizzly bears and man (dangerous, nondangerous, total), a measure of solitude at backcountry campsites, and the volume of backcountry overnight use. This system could be used to help people plan trips to meet their objectives while encouraging a pattern of use that results in fewer grizzly conflicts.

KEYWORDS: Grizzly bear, trail impacts, Glacier National Park.

123. Stuart, T. W.

1978. Management models for human use of grizzly bear habitat. Trans. North Am. Wildl. and Nat. Resour. Conf. 43:434-441.

Management models were developed for overnight backcountry trips in Glacier National Park. Models are linear programs in which the variables are backcountry overnight trips during specific time periods. Solutions to the models identify backcountry overnight use patterns that are optimal for various combinations of management objectives. Essentially the same as the preceding paper.

KEYWORDS: Grizzly bear, trail impact, Glacier National Park.

124. Taylor, R.

[In Press]. Certain aspects of behavior and management of the grizzly bear in Montana. 4th Int. Conf. on Bear Research and Management. Feb. 21-24, 1977. Kalispell, Mont.

Describes circumstances of the deaths of grizzly bears between 1958 and 1963. Outside of national parks, bears do not have an opportunity to develop bad habits, probably due to hunting and protection of property by private citizens.

KEYWORDS: Grizzly bears, wildlife management, Montana.

125. Davids, R. C.

1978. Polar bears aren't pets, but this town is learning how to live with them. Smithsonian 8(11):70-79.

Describes the positive attitudes of the people of Churchill, Manitoba, toward polar bears, and the manner in which coexistence occurs. Churchill is on a polar bear migration route. Because these bears are threatened with extinction, the people of Churchill are determined to coexist with the bears in spite of frequent encounters.

KEYWORDS: Polar bears, coexistence, Hudson Bay.

Cats

126. Culbertson, N.

1977. Status and history of the mountain lion in the Great Smoky Mountains National Park. USDI Natl. Park Serv., Uplands Field Res. Lab., Great Smoky Mountains Natl. Park Manage. Rep. 15, 70 p.

Lion sightings are increasing in the Great Smoky Mountains National Park. As interactions with humans increase lion attacks on people can be expected to increase. The most important factor determining the future of lions in this area will be the public's attitude toward lions. Hunters, especially those hunting with dogs, may pose a threat to lions in this area.

KEYWORDS: Mountain lions, Great Smoky Mountains National Park.

127. Saile, B.

1977. Cougar attacks: new crisis for the big cats. Outdoor Life 160(2):66-68, 126, 127, 128.

Mountain lions in the West are stable or increasing even though human populations are increasing and encroaching on mountain lion habitat. The number of mountain lion attacks on humans has increased in recent years.

KEYWORDS: Mountain lions, danger.

128. U.S. Fish and Wildlife Service, Region 1.

1976. Transactions of the mountain lion workshop of the western states and Canada. [Sparks, Nevada, Jan. 13, 14, 1976.] 190 p.

The number of lion attacks on humans has recently increased significantly in British Columbia. This is thought to be the result of increased lion-human interactions. Lions are living in areas of human density such as subdivisions. Lion attacks on humans have also increased suddenly in New Mexico.

KEYWORDS: Mountain lions, danger, British Columbia, New Mexico.

Ungulates

(Also see reference numbers 10-13, 19, 188)

Elk

(Also see reference numbers 4, 21, 30, 32, 33, 154, 184, 186, 190, 223)

129. Altman, M.

1956. Patterns of herd behavior in free-ranging elk of Wyoming. *Zoologica* (N.Y.) 41:65-71.

Account of free-ranging elk behavior. Compares behavior of disturbed and undisturbed elk herds during rut. Describes reactions of previously undisturbed elk to the opening of hunting season.

KEYWORDS: Elk, human disturbance, Wyoming.

130. Altman, M.

1958. The flight distance in free-ranging big game. *J. Wildl. Manage.* 22(2): 207-209.

The distance at which free-ranging elk and moose would flee from humans varied with habitat, social groupings, nutrition, reproductive status, and specific experience of individual animals of the group.

KEYWORDS: Elk, moose, flight distance.

131. Lieb, J. W.

1973. Social behavior in Roosevelt elk cow groups. M.S. thesis. Humboldt State Univ., Arcadia, Calif. 82 p.

In Prairie Creek Redwoods Park, increasing human disturbance during the early summer caused increased aggression among members of cow elk groups. This may be due to a decrease in tolerance by elk for each other under insecure conditions. Rutting bulls reacted aggressively towards approaching humans in 13 of 17 cases of human disturbance. Suggests that human disturbance should be controlled, especially during the reproductive portions of the year.

KEYWORDS: Elk, human disturbance, California.

132. Lieb, J. W., and A. S. Mossman.

1974. Elk drowning. *Murrelet* 55(3):39-40.

A bull elk, unfamiliar with inland escape routes through cliffs, fled from researcher into the ocean and drowned. Also cites another similar case. Suggests that frightened animals that are not familiar with alternative escape routes may flee into water. People should avoid disturbing frightened elk near large or rough bodies of water when inland escape appears blocked.

KEYWORDS: Elk, human impact, California.

133. Lieb, J. W., and A. S. Mossman.

1966. Final progress report on Roosevelt elk in Prairie Creek Redwoods State Park. Calif. Dep. Parks and Recreat., Interagency Agreement 4-05094-025, 8 p.

In response to human disturbance, elk moved from primary to secondary forage areas and cows with young calves moved away from the central part of their home ranges. Play and rutting activity were disrupted by human disturbance. Recommends reducing human disturbance at certain locations in order to retain elk herds in these areas, posting signs explaining why visitors should not disturb elk (especially during rutting and calving), and enforcement of regulations (including elimination of poaching).

KEYWORDS: Elk, human disturbance, recreation management, California.

134. Morgantini, L. E., and R. J. Hudson.

1979. Human disturbance and habitat selection in elk. *In* Symposium on elk ecology and management. p. 132-139. [Laramie, Wyoming, April 3-5, 1978.]

Habitat selection by elk was not simply related to weather conditions or available food. Passive harassment resulting from human activities (vehicular and hunting) reduced elk use of open grassland (transected by roads) and caused overgrazing of marginal areas (away from roads). This may be especially hard on elk during severe winters when energy budgets are stressed.

KEYWORDS: Elk, winter, human disturbance, Alberta.

135. Shultz, R. D., and J. A. Bailey.

1978. Responses of national park elk to human activity. *J. Wildl. Manage.* 42(1):91-100.

Responses of elk to human activities near a road were quantified for fall, winter, and spring in Rocky Mountain National Park. These elk, which experienced little or no hunting, were not significantly disturbed by normal on-road visitor activities.

KEYWORDS: Elk, human disturbance, winter, Rocky Mountain National Park.

136. Ward, A. L.

1973. Elk behavior in relation to multiple uses on the Medicine Bow National Forest. *Proc., 53rd Conf. West. Assoc. of State Game and Fish Commissioners.* p. 125-139.

Telemetry was used to monitor elk behavior in relation to multiple use of the forest. Elk and cattle were compatible where there was adequate food. Elk preferred to be at least one-half mile from people who were engaged in out-of-vehicle activities.

KEYWORDS: Elk, radio telemetry, human disturbance, Wyoming.

137. Ward, A. L., J. J. Cupal, A. L. Lea, C. A. Oakley, and R. W. Weeks.

1973. Elk behavior in relation to cattle grazing, forest recreation and traffic. *Trans. North Am. Wildl. and Nat. Resour. Conf.* 38:327-337.

Telemetered elk in Wyoming study area preferred to be one-half mile distant from people who were camping, picnicking, and fishing. Suggests that in planning recreation facilities in elk habitat, people concentration areas should be one-half mile from elk feeding sites and provide adequate cover buffer zones.

KEYWORDS: Elk, recreation management, radio telemetry, Wyoming.

Mule Deer

(See reference numbers 3, 4, 18, 30-33)

White-Tailed Deer

138. Behrend, D. F., and R. A. Lubeck.

1968. Summer flight behavior of white-tailed deer in two Adirondack forests. J. Wildl. Manage. 32(3):615-618.

Distances at which antlered deer took flight were significantly longer on hunted than unhunted areas.

KEYWORDS: White-tailed deer, flight distance.

139. Moen, A. N.

1976. Energy conservation by white-tailed deer in the winter. Ecology 57(1): 192-198.

Analyzes energy-conserving behavioral adaptations of white-tailed deer in north-western Minnesota during the winter. Energy conservation of up to 1,000 Kcal/day for a 60 kg deer can result from reduced activity levels (seeking level land and lesser snow depth, walking slowly, etc.). Winter harassment of deer by dogs or snowmobile traffic is detrimental to these adaptations.

KEYWORDS: White-tailed deer, winter, harassment, Minnesota.

140. Moen, A. N.

1978. Seasonal changes in heart rates, activity, metabolism, and forage intake of white-tailed deer. J. Wildl. Manage. 42(4):715-738.

Annual cycles of white-tailed deer metabolism were studied. Deer metabolism is the lowest in the winter and the highest during the summer. This is an adaptation for energy conservation because the animal's needs are lowest when the range resources are reduced. The author concludes from this and earlier work that the white-tailed deer is well adapted "for energy conservation in the winter and any disturbance that alters this mode of life is a potential depressant of productivity."

KEYWORDS: White-tailed deer, winter.

Moose

(Also see reference numbers 4, 30, 31, 130)

141. Denniston, R. H.

1956. Ecology, behavior and population dynamics of the Wyoming or Rocky Mountain moose. Zoologica (N.Y.) 41:105-118.

Suggests that the success of moose in the Rocky Mountain area may be due in part to their adaptability to human influences. Moose will often tolerate a quiet, unobstrusive observer, but may be frightened by an unsuccessful attempt to stalk. Threat behavior and attacks may be elicited from cows with calves or animals in threatened situations. Most moose-human encounters occur in the winter.

KEYWORDS: Moose, Wyoming.

142. de Vos, A.

1958. Summer observations on moose behavior in Ontario. J. Mammal. 39(1):128-139.

Short section on behavior after disturbances. Behavior of disturbed moose is very subtle, giving the impression of no alarm. Often they move slowly until they reach cover where they may break into a run, indicating more fear than initially exhibited.

KEYWORDS: Moose, flight distance, Ontario.

143. Geist, V.

1963. On the behavior of the North American moose (*Alces alces andersoni* Peterson 1950) in British Columbia. Behavior 20:377-416.

Calf and yearling moose are sometimes quite tame when adults are absent. The sight of man at close range causes most animals to run; however, there is considerable variation among individual moose. Cites cases where moose did not take flight even when one of the group was shot. Intense feeding often occurs after disturbance has passed.

KEYWORDS: Moose, human disturbance, British Columbia.

144. LeResche, R. E.

1966. Behavior and calf survival in Alaska moose. M.S. thesis. Univ. Alaska, Fairbanks. 85 p.

Reactions of moose to human disturbance ranged from flight, through slowly drifting away, to seeming disinterest. Cows with calves were the most wary.

KEYWORDS: Moose, human disturbance, Alaska.

145. McMillan, J. F.

1954. Some observations on moose in Yellowstone Park. Am. Midl. Nat. 52(2):392-399.

In areas of heavy tourist pressure, moose develop considerable tolerance for human disturbance, moving slowly and returning soon. In a control area visitor disturbance caused moose to run from area and not return until at least the next day.

KEYWORDS: Moose, human disturbance, Yellowstone National Park.

146. Stringham, S. F.

1974. Mother-infant relations in semi-captive Alaskan moose (*Alces alces, gigas*). M.S. thesis. Univ. Alaska, Fairbanks. 140 p.

Reactions of moose to the researcher are described in methods section. Moose habituated to researcher but were disturbed by persistence of researcher once they were aware of his presence.

KEYWORDS: Moose, habituation.

Caribou

(Also see reference number 31)

147. Bergerud, A. T.

1971. The role of the environment in the aggregation, movement and disturbance behavior of caribou. In The behavior of ungulates and its relation to management, Vol 2. p. 530-541. V. Geist and F. Walther, eds. Int. Union Conserv. Nat. Resour. Publ. New Series 24, Morges, Switzerland.

Discusses caribou behavioral adaptations and adaptability. The author believes caribou can live near man if man permits it. Suggests that, in populations not subject to natural predation, wildlife managers should harvest unwary animals if they want animals that are difficult to hunt, and harvest wary animals if they desire a population that can be seen in a park.

KEYWORDS: Caribou, wildlife management.

148. Calif, G. W.

1976. Numbers beyond counting, miles beyond measure. Audubon 78(4):42-61.

Considers the physical effects of the Alaskan pipeline on caribou migration as well as effects of construction workers in terms of more roads, aircraft, snowmobiles, hunting, and general harassment. Author believes caribou can live near man if man permits it.

KEYWORDS: Caribou, human impact.

149. de Vos, A.

1960. Behavior of barren-ground caribou on their calving grounds. J. Wildl. Manage. 24:250-258.

Contains section on reaction of caribou to humans. Flight distance varied with environmental conditions and band size. Cows with calves were more alert and ran farther than cows without calves.

KEYWORDS: Caribou, flight distance.

150. Freddy, D. J.

1973. The status and management of the Selkirk caribou herd 1973. M.S. thesis. Univ. Idaho, Moscow. 132 p.

Selkirk caribou herd's future is precarious because of its small size (about 20-25 animals). Sustaining this herd depends on maintaining movement routes, maintaining mature subalpine fir-Engelmann spruce winter habitat, and controlling human-induced mortality. Illegal hunting and road kills were the only sources of mortality during the study. Management recommendations are included.

KEYWORDS: Caribou, wildlife management, human impact.

151. Stelfox, J. G., and J. A. Bindernagel.

1978. Caribou behavior in relation to human-elk-wolf influences: Jasper National Park 1971-1974. Prepared for Parks Canada by the Canadian Wildl. Serv., Edmonton. 59 p.

Examines encroachment of elk and hikers onto caribou ranges in Jasper. Caribou, especially cows, are most vulnerable to harassment in spring and summer when humans and caribou both make greatest use of alpine tundra. Management suggestions include placing hiking trails away from major caribou ranges and/or restricting hikers during critical calving periods, and minimizing harassment at natural licks and on calving, rearing, and rutting ranges.

KEYWORDS: Caribou, recreation management, trail impacts, Jasper National Park.

Pronghorn

(See reference numbers 32, 33)

Mountain Goat

152. Bansner, U.

1976. Mountain goat-human interactions in the Sperry-Gunsight pass area, Glacier National Park. Senior thesis, Univ. Mont., Missoula. 46 p.

Describes attraction of salt, from human and horse urine and from blasting, in luring goats to areas of human concentration. Notes potential danger to visitors from habituated goats. Management suggestions include reducing the salt from urine by improving sanitary facilities, blasting only when manpower is inadequate, and informing users about mountain goat ecology and behavior so they are aware of potential safety hazards.

KEYWORDS: Mountain goat, danger, salt, recreation management, trail impacts, Glacier National Park.

153. Holroyd, J. C.

1967. Observations of Rocky Mountain goats on Mount Wardle, Kooteney National Park, B. C. Can. Field-Nat. 81:1-22.

Reports reaction of goats to the author. Response varied according to season, size of group, and circumstances under which they were encountered. Reactions ranged from flight to charges.

KEYWORDS: Mountain goat, British Columbia.

154. Singer, F. J.

1975. Behavior of mountain goats, elk and other wildlife in relation to U.S. Highway 2, Glacier National Park. Glacier Natl. Park, West Glacier, Mont. 96 p.

Analyzes the effect of U.S. Highway 2 with its associated vehicles and people on various wildlife species, especially goats using salt lick, in order to form a basis for options in proposed highway reconstruction. Considers behavioral characteristics of goats, elk, grizzly, and wolves as well as humans in recommending highway construction alternatives. This paper demonstrates practical application of knowledge of animal behavior to a management problem.

KEYWORDS: Mountain goat, elk, grizzly bear, wolves, highway, animal behavior, wildlife management, Glacier National Park.

155. Singer, F. J.

1978. Behavior of mountain goats in relation to U.S. Highway 2, Glacier National Park, Montana. J. Wildl. Manage. 43(2):591-597.

The behavior of mountain goats crossing a highway to visit a natural mineral lick was studied. Groups of goats were more successful at crossing the highway than individual goats. Groups led by a nanny with kid at side had the most success at crossing. Peak use of the lick (July and August) was also the peak in visitor activity. Goat use of the lick during this time was primarily at night, whereas use of an undisturbed lick did not follow this pattern. Because of disturbance during crossings and the potential for goat-car collisions, a goat crossing and restriction of visitors from crossing area was recommended. The proposed goat crossing is an underpass in the main goat crossing area. Goat movements in other areas would be restricted by fencing and a bin wall. Lead-in fences, protective conifer cover, and trails will help encourage goat use of structures.

KEYWORDS: Mountain goats, highway, wildlife management, Glacier National Park.

156. Smith, B. L.

1976. Ecology of Rocky Mountain Goats in the Bitterroot Mountains, Montana. M.S. thesis. Univ. Mont., Missoula. 189 p.

Recommends leaving land adjacent to goat winter ranges roadless to prevent overharvesting accessible herds and to reduce harassment. Makes management recommendations concerning buffer zones, logging, hunting, and roads.

KEYWORDS: Mountain goats, roads, Montana.

Mountain Sheep (Bighorn)

(Also see reference numbers 4, 14)

157. Blong, B.

1967. Desert bighorn and people in the Santa Rosa Mountains. Calif. Nev. Section Meeting, Wildl. Soc. Trans., p. 66-70.

Human disturbance and habitat loss due to urban development threaten the survival of desert bighorn in the Santa Rosa Mountains of California.

KEYWORDS: Bighorn sheep, human impact, California.

158. DeForge, J. R.

1972. Man's invasion into the bighorn's habitat. Trans. Desert Bighorn Counc. 16:112-116.

Man's invasion into bighorn sheep habitat in the San Gabriel Mountains in the form of logging, vacationers, motorcyclists, and hunters has caused a reduction in the number of sheep using the area. Expresses concern that this may be occurring in other areas of sheep habitat.

KEYWORDS: Bighorn sheep, human impact, California.

159. DeForge, J. R.

1976. Stress: Is it limiting Bighorn? Trans. Desert Bighorn Counc. 20:30-31.

Man's impact on sheep habitat is causing stress that appears to be the major limiting factor in the bighorn's struggle for survival.

KEYWORDS: Bighorn sheep, human impact.

160. Dixon, J. S.

1936. The status of the Sierra bighorn sheep. Proc. First North Am. Wildl. Conf. p. 641-643.

The author believes that increase in recreational camping, illegal shooting, and grazing of domestic sheep on bighorn summer ranges were primary factors limiting bighorn sheep.

KEYWORDS: Bighorn sheep, human impact.

161. Dunaway, D. J.

1970. Status of bighorn sheep populations and habitat studies on the Inyo National Forest. Trans. Desert Bighorn Counc. 14:127-146.

Suggests that increased recreational use of sheep ranges has resulted in the decline of sheep use. Off-trail backpacking in alpine areas should be monitored for its effects on sheep.

KEYWORDS: Bighorn sheep, backpackers, California.

162. Dunaway, D. J.

1971a. Bighorn sheep habitat management on the Inyo National Forest, a new approach. Trans. Desert Bighorn Counc. 15:18-23.

Human use of bighorn sheep ranges seems to be a major factor in the decline of sheep populations in the Sierra Nevadas during the past 20 years. Proposes a bighorn sheep zoological area to include the two largest herds of bighorn remaining in the Sierras. Management objectives are to protect and maintain bighorn habitat and limit human use in key areas.

KEYWORDS: Bighorn sheep, human disturbance, wildlife management, California.

163. Dunaway, D. J.

1971b. Human disturbance as a limiting factor of Sierra Nevada bighorn sheep. Trans. North Am. Wild Sheep Conf. 1:165-173.

Examines the impact of predation, grazing competition, disease, and parasites on bighorn sheep and concludes human disturbance and loss of habitat are the major causes for the population decline. The author recognizes that this may be an incorrect conclusion, but because some bighorn populations are already limited, every effort should be made to protect these animals.

KEYWORDS: Bighorn sheep, human impact, Sierra Nevada.

164. Elder, J. M.

1977. Human interactions with Sierra Nevada bighorn sheep: the Mount Baxter herd. M.S. thesis. Univ. Mich., Ann Arbor. 102 p.

Describes interaction of sheep with backpackers and climbers. Climbers had greatest potential effects on sheep. Questions the effects on sheep of allowing stock and pets or numbers of people greater than 1976 levels in the Mount Baxter area.

KEYWORDS: Bighorn sheep, backpackers, Sierra Nevada.

165. Geist, V.

1975a. Bighorn sheep biology. Wildl. Soc. News 136:61.

Points out the value of older rams in sheep populations. Also discusses effects of harassment, concluding that "the worst combination of harassment is hunting combined with hiking, particularly camera-happy hiking, for the second reinforces what the first one teaches--flight from humans".

KEYWORDS: Bighorn sheep, harassment, hikers, photographers.

166. Geist, V.

1975c. On the management of mountain sheep; theoretical considerations. In The wild sheep in modern North America. p. 77-105. J. B. Trefethen, ed. Boone and Crockett Club. 302 p. Winchester Press, New York.

Discusses methods of managing sheep populations depending on the management objectives of consumptive or nonconsumptive uses. Describes deleterious effects of hunting combined with hiking on sheep populations. In unharmed populations, habituation of sheep can insure continued use of best range and still allow public viewing. Emphasizes the need for public education so that people will know what to expect from the animals, as well as how they should behave around the animals.

KEYWORDS: Bighorn sheep, Dall sheep, wildlife management, habituation, harassment, education.

167. Graham, H.

1966. Multiple use coordination on the San Gorgino bighorn unit. Trans. Desert Bighorn Council. 10:71-76.

Recommendations for multiple-use coordination with bighorn sheep management in the San Gorgino bighorn unit. Discusses road, trail, and campsite locations in relation to areas used by bighorns.

KEYWORDS: Bighorn sheep, recreation management, trail impacts, California.

168. Hansen, C. G.

1971. Overpopulation as a factor in reducing desert bighorn populations. Trans. Desert Bighorn Council. 15:46-52.

Discusses human encroachment on bighorn habitat forces sheep into smaller areas and poorer, more remote ranges. The effects on sheep may be similar to overpopulation stress that may cause natural population control.

KEYWORDS: Bighorn sheep, human impact.

169. Hicks, L. L.

1977. Human disturbance of the Mount Baxter herd of Sierra Nevada bighorn sheep. M.S. thesis. Univ. Mich., Ann Arbor. 57 p.

Sheep reactions to humans depend on herd size, distance to people, and relative position of people on the mountain. Humans approaching from above caused more disturbance than those approaching from below. Small groups of sheep were more susceptible to disturbance than large groups. Management recommendations included rerouting trails away from areas of concentrated sheep use and restriction of some forms of human activity.

KEYWORDS: Bighorn sheep, human disturbance, recreation management, trail impacts, Sierra Nevada.

170. Horejsi, B.

1976. Some thoughts and observations on harassment and bighorn sheep. *In* North. Wild Sheep Counc. Proc. p. 149-155. Jackson, Wyo.

Coal exploration and development, ski resorts, and increasing outdoor recreation are causing year-round contact of man and sheep. The combination of hunting (resulting in fear of man) and continuous recreational use of sheep range result in year-round harassment of sheep. If the integrity of sheep populations is to be maintained, then research and regulations need to be aimed at minimizing or eliminating harassment.

KEYWORDS: Bighorn sheep, harassment.

171. Light, J. T. R.

1971. An ecological view of bighorn habitat on Mount San Antonio. *Trans. North Am. Wild Sheep Conf.* 1:150-157.

Bighorn use of habitat does not occur where human use is heavy. High-value habitat heavily used by humans will exclude bighorn use. Bighorns tolerate only limited human disturbance before being driven from home ranges. Ewes with young are less tolerant of human approaches than individual ewes and rams.

KEYWORDS: Bighorn sheep, human disturbance, California.

172. MacArthur, R. A., R. H. Johnston and V. Geist.

[In Press]. Factors influencing heart rate in free-living bighorn sheep: a physiological approach to the study of wildlife harassment. *Can. J. Zool.*

KEYWORDS: Bighorn sheep, heart rate telemetry, harassment.

173. McCann, L. J.

1956. Ecology of the mountain sheep. *Am. Midl. Nat.* 56(2):297-325.

Contains brief section on wariness. The ewes and young were tolerant of human presence during the study. Mature rams took flight at the sight of man. This was considered to be the result of hunting pressure on rams.

KEYWORDS: Bighorn sheep, Wyoming.

174. Nelson, M.

1966. Problems of recreational use of game ranges. *Trans. Desert Bighorn Counc.* 10:13-20.

Discusses the detrimental effects of different forms of recreation on bighorn sheep and the ability of sheep to adapt. Suggests need to classify critical game range lands for lasting protection and minimum public interference.

KEYWORDS: Bighorn sheep, recreation.

175. Tevis, L., Jr.

1959. Man's effect on bighorn in the San Jacinto-Santa Rosa Mountains. Desert Bighorn Counc. Trans. 3:69-74.

Discusses the effects of man on the bighorn sheep in the Palm Springs resort area from pre-white man to present. Makes some management suggestions to reduce impact and suggests research on the effects of subdivision of the sheep range.

KEYWORDS: Bighorn sheep, human impact, California.

176. Van Den Akker, J. B.

1960. Human encroachment on bighorn habitat. Desert Bighorn Counc. Trans. 3:38-40.

The author feels that the future welfare of the bighorn will be determined by the control of human encroachment on bighorn habitat. Singly, most types of encroachment (hiking, ORV's, introduction of domestic animals to compete for range and water, military activities, highways, and reservoirs) may not eliminate bighorns, but the uncontrolled cumulative effect has that potential.

KEYWORDS: Bighorn sheep, human impact.

177. Wehausen, J. D., L. L. Hicks, D. P. Garber, and J. Elder.

1977. Bighorn sheep management in the Sierra Nevada. Trans. Desert Bighorn Counc. 21:30-32.

Zoological areas were established to protect bighorn sheep from the assumed adverse effects of human disturbance. Subsequent research suggested that human disturbance was not as significant a factor as supposed. Management policies are being revised to allow relaxation of the rules for visitors while keeping bighorn management as first priority. When dealing with jeopardized populations, the authors feel prompt conservation action should be taken on the basis of untested hypotheses. If these hypotheses are proven inaccurate, management may be altered.

KEYWORDS: Bighorn sheep, recreation management, human disturbance, Sierra Nevada.

178. Welles, R. E., and F. B. Welles.

1961. The bighorn of Death Valley. Fauna of the National Parks of the U.S. Fauna Series No. 6. U.S. Govt. Printing Off. 242 p. Washington, D.C.

Reports on an 8-year study of desert bighorn in Death Valley National Monument. Deliberate attempts of humans to conduct themselves within limits acceptable to bighorn led to tolerance of human presence. Describes influence of herd leader on acceptance of humans. Concludes that "only unchecked human encroachment appears actually to threaten the future status of the bighorn."

KEYWORDS: Bighorn sheep, habituation, human impact, Death Valley National Monument.

179. Wilson, L. D.

1969. The forgotten desert bighorn habitat requirement. Trans. Desert Bighorn Counc. 13:108-113.

Points out that although some bighorn sheep do tolerate man, these are actually individual exceptions. Bighorn tend to be intolerant of people, autos, livestock, and other ungulates. If they are to survive they must be given higher priorities in land-use planning.

KEYWORDS: Bighorn sheep, human impact.

180. Woodward, T. N., R. J. Gutierrez, and W. H. Rutherford.
1974. Bighorn ram production, survival and mortality in south-central Colorado.
J. Wildl. Manage. 38(4):771-774.

In the Sangre de Cristo range in Colorado, human pressures have forced mountain bighorn into lambing ranges at higher elevations where extended bad weather can cause 80 percent incidence of pneumonia in lambs and a steady decline in population.

KEYWORDS: Bighorn sheep, human impact, Colorado.

Dall Sheep

(Also see reference numbers 1, 31, 85, 166)

181. Anderson, R.
1971. Effects of human disturbance on Dall sheep. Alaska Coop. Wildl. Res. Unit Quart. Rep. 22(3):23-27.

Dall sheep in Atigun Canyon in the Brooks Range were studied because of the possibility of this route for the Trans-Alaska pipeline. Describes reaction of sheep to people on the ground and to aircraft. Suggests restricting flying and construction to reduce harassment of sheep, especially early in season, during lambing, and near mineral licks. Recommends routing pipeline elsewhere.

KEYWORDS: Dall sheep, wildlife management, salt, human impact, Alaska.

182. Price, R.
1972. Effects of human disturbance on Dall sheep. Alaska Coop. Wildl. Res. Unit. Quart. Rep. 23(3):23-28.

Dall sheep in Atigun Canyon in the Brooks Range were studied because of the possibility of this route for the Trans-Alaska pipeline. Sheep were disturbed by helicopters, but long term effects are not known. Suggests that aircraft pilots using the canyon be made aware of the possible consequences of disturbance. Recommends no on-ground activities in the canyon from mid-May thru early July because of lambing, and carefully regulated activities after that. Mineral lick areas may need special protection to prevent harassment of sheep using them.

KEYWORDS: Dall sheep, human impact, wildlife management, salt, Alaska.

Harassment Reduction Literature

WILDLIFE MANAGEMENT AND HABITAT MANIPULATION

(Also see reference numbers 12, 13, 16, 17, 20, 23, 30, 55, 60, 66, 68-70, 72-75, 79, 82, 83, 89, 91, 95-97, 100, 102, 104, 105, 107, 109, 147, 150, 154-156, 164, 166, 167, 175, 181)

183. Allen, D.
1966. The preservation of endangered habitats and vertebrates of North America. In Future environments of North America, p. 22-37. F. Frazer Darling and John Milton, eds. The Natural History Press, Garden City, N.Y.

Cites classic examples of animals whose existence has been jeopardized by man or his actions, and reports on what has been done to better manage individual wildlife populations.

KEYWORDS: Wildlife, human impact.

184. Anderson, E. W., and R. T. Scherzinger.

1975. Improving quality of winter forage for elk by cattle grazing. J. Range Manage. 28(2):120-125.

Cattle grazing was manipulated (area, time of year, and numbers) to increase forage quality for wintering elk on a wildlife management area in northeastern Oregon. (In a period without cattle grazing, forage had become rank and of low quality for wintering elk.) The success of this system was also attributed to other factors, among which were: the creation of new ponds and salting for better distribution of grazing, and closure of the area from December 1 to May 1 to prevent harassment of elk by snowmobilers.

KEYWORDS: Elk, winter, wildlife management, habitat modification, human impact, Oregon.

185. Bart, J.

1977. Impact of human visitations on avian nesting success. Living Bird. 16:187-192.

Field observers studying nesting birds may lead predators to nests. This study documents increased predation on the day after a human visit to nests of robins, bluebirds, and mourning doves. Recommends methods of making trails so that predators are not led directly to nests.

KEYWORDS: Robin, bluebird, mourning dove, birdwatching, human impact.

186. Batcheler, C. L.

1968. Compensatory responses of artificially controlled mammal populations. N.Z. Ecol. Soc. Proc. 15:25-30.

Red deer were hunted and harassed in areas of good habitat where deer caused damage. Deer displaced to areas of poor habitat were left undisturbed. These deer became nocturnal and experienced reduced reproductive rates, and lower fat deposition. They did not return to good habitat after cessation of hunting and harassment.

KEYWORDS: Red deer, harassment, New Zealand.

187. Batten, L. A.

1977. Sailing on reservoirs and its effects on water birds. Biol. Conserv. 11:49-58.

Water bird populations are increasingly disturbed by the use of reservoirs by recreationists. Suggests reserving a large, shallow, marshy, portion of a reservoir for birds, with no boat access allowed.

KEYWORDS: Water birds, water recreation, human disturbance.

188. Cowan, I. McT.

1971. Management implications of behavior in the large herbivorous mammals.

In *The Behavior of Ungulates and its Relation to Management*, vol. 2. p. 921-934. V. Geist and F. Walther, eds. International Union for Conservation of Nature. No. 24, Morges, Switzerland.

This is a substantial literature review relating animal behavior to possible management techniques. Cites many examples of animal behavior and animal learning that could relate to possible management techniques. Suggests that a thorough knowledge of species-specific behavior allows managers to adjust management practices to fit objectives. Comments on the impacts on nonconsumptive users on wildlife. Suggests protection of females with young, breeding grounds, and birthing areas. Suggests educating visitors to behave appropriately in areas where animals are habituated.

KEYWORDS: Ungulates, animal behavior, wildlife management, education.

189. Geist V.

1978. Behavior. In Big Game of North America; ecology and management. p. 283-296. J. L. Schmidt and D. L. Gilbert, eds. Wildl. Manage. Inst. 494 p.

A thorough treatment of the significance of animal behavior in the management of wildlife. Examines the effects of harassment on wild animals. Proposes teaching game animals to accept the presence of humans. Humans must also be taught not to approach wild animals too closely.

KEYWORDS: Animal behavior, harassment, wildlife management.

190. Geist, J. M., P. J. Edgerton, and G. S. Stickler.

1974. 'Yucky to Yummy'--with fertilizers. Rangemen's J. 1(2):39-41.

An experiment on the effects of fertilizer on timothy seeded in a clearcut resulting in elk eating most of the fertilized grass. Potential benefits of fertilizer include attracting elk to public viewing areas, relieving grazing pressure on native species of vegetation, and improving the nutrition of elk during calving. The authors suggest more research on fertilizer as a management tool.

KEYWORDS: Elk, fertilizer, habitat modification, Oregon.

191. Hendee, J. C., G. H. Stankey, and R. C. Lucas.

1978. Wilderness management. U.S. Govt. Print. Off. 381 p. Washington, D.C.

Summary and synthesis of information pertinent to management of the National Wilderness Preservation System. Chapter 11 by John Hendee and Clay Schoenfeld identifies wilderness wildlife values and proposes management objectives for their attainment; it is the precursor of Wildlife Management in Wilderness (1978) by the same authors.

KEYWORDS: Wildlife management, wilderness management.

192. Schoenfeld, C. A., and J. C. Hendee.

1978. Wildlife management in wilderness. 172 p. The Boxwood Press, Pacific Grove, Calif.

Addresses man-wildlife interactions in wilderness. Looks at the problems of wildlife management (largely the management of man) within the restrictions of the Wilderness Act. Contains many examples of man-wildlife interactions.

KEYWORDS: Wildlife management, wilderness.

193. Smith, O. A., Jr., and A. D. Geis.

1956. Comparative psychology in wildlife conservation. Am. Psychol. 11:183-187.

Suggests that comparative psychology might be used to alter the behavior of game animals so that they could avoid dangerous situations. This could allow the animals to survive longer and in turn provide better recreational opportunities for man. Proposes some psychology courses that would benefit researchers. Suggests that this aspect of wildlife management would open employment opportunities in the field of conservation.

KEYWORDS: Animal behavior, wildlife management.

194. Stokes, A. W., and D. F. Balph.

1965. The relation of animal behavior to wildlife management. Trans. North Am. Wildl. Nat. Resour. Conf. 30:401-410.

The authors feel that wildlife biologists should be educated in the field of animal behavior and apply behavioral concepts to management problems.

KEYWORDS: Animal behavior, wildlife management.

195. U.S. Department of Interior.

1977. A summary of the natural resources management plan, Yosemite National Park.
U.S. Dep. Interior, 15 p. Washington, D.C.

Contains a management plan for wildlife and fisheries. Problems with man-black bear interactions have prompted the need to control artificial food sources.

KEYWORDS: Wildlife management, Yosemite National Park.

RECREATION MANAGEMENT

Social Science/Wildlife Management Relationships

196. Clark, R. N.

1974. Social science, social scientists, and wildlife management. *In* 38th Federal-Provincial Wildl. Conf. Trans. p. 103-107. Victoria, B. C.

Discusses the need for incorporating social science concepts and procedures into wildlife management programs to provide wildlife benefits to people. The problems involved include: misunderstandings due to technical language and specialized orientation, inability to accept advice from another discipline, and lack of clearly defined objectives.

KEYWORDS: Wildlife management.

197. Hendee, J. C., and D. R. Potter.

1971. Human behavior and wildlife management: needed research. Trans. North Am. Wildl. Nat. Resour. Conf. 36:383-396.

This paper is written from the consumptive viewpoint. It points out need for research to determine what kind of uses man wants to make of wildlife.

KEYWORDS: Human behavior, wildlife management.

198. Hendee, J. C., and C. A. Schoenfeld.

1973. Human dimensions in wildlife programs. Wildlife Management Inst. 193 p. Washington, D.C.

This report is concerned with the human behavior aspects of wildlife management. Examines outdoor and wildlife recreation experience, hunter satisfactions, antihunter attitudes, and applying human dimensions to wildlife management.

KEYWORDS: Human behavior, wildlife management.

199. Lime, D. W.

1976. Wildlife is for non-hunters too. *J. For.* 74(9):600-604.

Suggests kinds of nonhunting wildlife experiences that could be offered to recreationists. Because recreationists value seeing and hearing wildlife, forest managers should offer opportunities for visitors to see and hear wildlife, and to see evidence of wildlife. Suggests talks, movies, nature walks, self-guiding trails, and nature centers.

KEYWORDS: Wildlife, recreation.

200. Lime, D. W., D. H. Anderson, and L. D. Mech.

1978. Guided expeditions to encounter wildlife: a plus for forest recreation users in Minnesota. *For. Assoc. for Interpretive Naturalists, West. Interpreters Assoc. Workshop-Conference, April 5-7, 1978. Tucson, Ariz.* 15 p.

"Two 1974 studies in the Superior National Forest of Minnesota demonstrate some positive effects people gain from encountering wildlife. Participants in wolf howling safaris and wildlife sign safaris enjoyed even indirect encounters with wildlife." These techniques could be used for public information and managing use patterns.

KEYWORDS: Wildlife, recreation, education, recreation management.

Human Attitudes and Perceptions of Wildlife

(Also see reference numbers 88, 217, 231)

201. Bart, W. M.

1972. A hierarchy among attitudes towards animals. *J. Environ. Educ.* 3(4):4-6.

Notes that the behavior of men will determine if endangered wildlife species will survive or be exterminated. A ranking of human attitudes toward different animals was obtained. Suggests educators work to change human attitudes toward animals in order to protect rare and endangered species.

KEYWORDS: Wildlife, human attitudes.

202. Brown, R. J., B. L. Driver, and G. H. Stankey.

1976. Human behavioral science and recreation management. *In* 16th IUFRO World Congr., Div. 6, [Oslo, Norway, June 1976] Proc., p. 53-63. Int. Union For. Res. Organ., Vienna, Austria.

Suggests that understanding recreational preferences and human behavior can be useful in making recreational management decisions.

KEYWORDS: Recreation, human behavior, recreation management.

203. Bryan, R. B., and M. C. Jansson.

1973. Perception of wildlife hazard in national park use. *In* Human dimensions in wildlife programs. p. 129-142. J. C. Hendee and C. A. Schoenfeld., eds. Wildlife Manage. Inst. 193 p. Washington, D.C.

Increasing visitation and road networks have increased contact between tourists and wildlife and the potential for accidents. Describes questionnaire survey of visitor perception of wildlife. Concludes that increasing urbanization reduces the accuracy of the public's perception of wildlife and may indirectly have unfavorable results for wildlife.

KEYWORDS: Wildlife, danger, national parks.

204. Hendee, J. C., and R. J. Burdge.

1974. The substitutability concept: implications for recreation research and management. *J. Leisure Res.* 6:157-162.

Leisure activity substitutability is defined as the interchangeability of recreation activities in satisfying the needs of the participants. In some cases, settings are of prime importance. In many other cases, the activity is more important than the place, and other activities or places could be substituted. This concept could be used to reduce disturbance of wildlife.

KEYWORDS: Recreation management.

205. Hendee, J. C., and G. H. Stankey.

1973. Biocentricity in wilderness management. *Bioscience* 23(9):535-538.

Presents a biocentric approach (i.e., maintenance of nearly natural energy flows within a wilderness ecosystem) to wilderness management. Unnatural changes in wilderness are often irreversible. A biocentric approach as opposed to an anthropocentric approach preserves options and facilitates a uniform and practical management policy.

KEYWORDS: Wilderness management.

206. Kellert, S. R.

- 1976a. Attitudes and characteristics of hunters and anti-hunters and related policy suggestions. Working pap. presented to Fish and Wildl. Serv., USDI, Nov. 4, 1976. 55 p.

Reports on a study of human attitudes and perceptions about wildlife, habitat, and hunting. Examines basic differences in philosophical outlook and sociocultural backgrounds of hunters and anti-hunters for potential application to wildlife management practices. Develops a typology of nine basic attitudes toward animals, and examines hunters and anti-hunters in relation to these attitudes. Recommends better conservation education programs and a reorganization of governmental regulatory activities to include expanded concern and funding for nongame wildlife species.

KEYWORDS: Human attitudes.

207. Kellert, S. R.

- 1976b. Perception of animals in American society. Trans. North Am. Wildl. Nat. Resour. Conf. 41:533-545.

This paper provides a typology of American attitudes toward animals to better understand people's motivations for involvement in animal-related activities such as hunting, pet ownership, birdwatching, etc. The distribution of these attitudes among major population groups (age, sex, education) and among major animal activity groups (hunters, humanitarians, and wildlifers) is discussed. Sex and education were the most important differentiators of attitudes toward animals.

KEYWORDS: Human attitudes, birdwatchers.

208. Kellert, S. R.

- 1977a. Americans and animals: perceptions and policy implications. Working pap. presented to Fish and Wildl. Serv., USDI. 37 p.

Deals with animal-related perceptions and activities of some major demographic groups in America. Attempts to provide practical orientation for management policies involving animal related issues such as endangered species, migratory bird protection, animal damage control, trapping, etc.

KEYWORDS: Human attitudes.

209. Kellert, S. R.

- 1977b. Attitudes towards animals and characteristics of various animal activity groups other than hunters. Working pap. presented to Fish and Wildl. Serv., USDI. 35 p.

This paper focuses on attitudes and characteristics of a variety of nonhunting activity groups such as backpackers, birdwatchers, zoo enthusiasts, trappers, etc. Policy implications are suggested for each group according to the kinds of attitudes, social characteristics, and geographic distribution.

KEYWORDS: Human attitudes, backpackers, birdwatchers.

210. Mihalic, D. A.

1974. Visitor attitudes toward grizzly bears in Glacier National Park, Montana. M.S. thesis. Mich. State Univ., East Lansing. 131 p.

The author attempted to determine visitor attitudes toward grizzly bears and the effect of that attitude on potential behavior in hypothetical bear-encounter situations. He found that visitor attitude toward bears was not related to potential visitor behavior.

KEYWORDS: Grizzly bear, human attitudes, Glacier National Park.

211. Stankey, G. H.

1976. Wilderness fire policy: an investigation of visitor knowledge and beliefs. USDA For. Serv. Res. Pap. INT-180, 17 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

"Discusses attitudes and knowledge of wilderness visitors towards wilderness fire suppression policy. Although most users favored suppression, a substantial minority favored a more natural role for fire. A major finding was that as visitor knowledge about the role of fire increased, the likelihood of support for a more natural role for fire also grew. Important policy implications include educating and involving the public, making gradual changes in fire policy, and developing a communications program aimed at different audiences." This technique could be applied to wildlife, substituting wildlife for fire.

KEYWORDS: Human attitudes.

212. Trefethen, J. B.

1975. An American crusade for wildlife. 409 p. Winchester Press and the Boone and Crockett Club.

Traces evolution of American attitudes toward wildlife from first settlers to present. Gives a historical account of extermination of wildlife. Contains numerous classic examples of the impact of man on wildlife.

KEYWORDS: Wildlife, human impact.

Modification of Human Behavior and Use Patterns to Reduce Impacts on Wildlife, Including Education

(Also see reference numbers 4, 23, 25, 34, 35, 38, 39, 68-70, 72, 75, 86, 93, 95, 97, 98, 102, 103, 105, 107-109, 111-113, 115, 121-123, 132, 133, 137, 151, 152, 167, 169, 177, 188, 200)

213. Bell, J. N.

1963. Wild animals are wild. Nat. Wildl. 1(5):34-36.

Suggests ways for national park visitors to avoid harmful interactions when encountering wildlife.

KEYWORDS: Wildlife, danger.

214. Curtis, S.

1974. How to track wildlife on skis. Backpacker 2(4):40-43, 79-80, 83.

Recommends techniques for approaching wildlife in winter for observation and photography. Warns of negative effects of disturbance on wintering wildlife. Cites snowmobile harassment of ungulates.

KEYWORDS: Wildlife, winter, skiers, photographers, ORV's.

215. Lime, D. W., D. H. Anderson, and L. D. Mech.

1978. Interpreting wildlife through guided expeditions. J. Interpret. 3(2)10-16.

Guided expeditions were initiated in the Superior National Forest of Minnesota. People participating in wolf-howling safaris and wildlife-sign safaris had fun (in spite of only indirect encounters with wildlife) and at the same time learned about wildlife. This concept could be a useful method of public education about wildlife.

KEYWORDS: Wildlife, education.

216. Lochmiller, R. L.

1978. Birding! Virginia Wildlife 39(12):10-11.

Describes birdwatchers, their dedication, and equipment. Concludes with five rules of birdwatching etiquette: (1) Avoid use of tape-recorded territorial calls of rare birds that are breeding; (2) observe nest from afar; (3) do not harass or handle eggs or young of rare or endangered birds; (4) respect property and wishes of private landowners; (5) avoid large groups, especially in critical habitat.

KEYWORDS: Birdwatchers, recreation management.

217. Trahan, R. G.

1977. Day-use limitation in national parks: visitor and park personnel attitudes toward day-use limitation systems for Rocky Mountain National Park. U.S. Dept. of the Interior, National Park Serv., Washington, D.C.

This paper reports on a study to determine attitudes, objectives, and perceptions of visitors and park personnel on day-use limitation systems in Rocky Mountain National Park. The objective was to develop a method of managing the increasing numbers of visitors. Although not immediately concerned with wildlife, methods used in this study could be applied to regulation of visitors specifically to protect wildlife. Visitors favored noncoercive systems of limitation. Hikers considered environmental problems good reasons for limiting day use.

KEYWORDS: Recreation management, Rocky Mountain National Park.

218. Wagar, J. A.

1964. The carrying capacity of wildlands for recreation. For. Sci. Monogr. 7:1-24.

This study analyzes carrying capacity in terms of (1) impact of recreational environment on people, (2) impact of people on the environment, (3) impact of people on people, and (4) management procedures to modify these reciprocal impacts. Management considerations include zoning, engineering, interpretation, and persuasion. These management methods could be applied to reduce man's impacts on wildlife.

KEYWORDS: Recreation management.

219. Wagar, J. A.

1975. Recreational insights from Europe. J. For. 73(6):353-357.

Describes zoning in European parks and forests. Some interesting and original techniques are used to separate mass recreation from natural areas. Includes examples of subtle zoning techniques and "hard line" zoning. These techniques could be applied to reduce man-wildlife conflicts in North America.

KEYWORDS: Recreation management.

220. Wagar, J. A.

1977. Resolving user conflicts. In Wildland recreation. p. 135-144. [Feb. 28-Mar. 3, 1977, Banff Center, Univ. Alberta.]

Seeks methods to manage increasing numbers of recreationists by: (1) establishing a system with zones that provide many options and protecting each option from people seeking values not intended for that option; (2) making the system visible so that people can choose the options they want; (3) improving energy flows through public participation in goal setting, interpretation to enrich visitor experience, and encouraging desired behavior; and, (4) when all else fails, regulation and enforcement. Concepts could be applied to wildlife problems.

KEYWORDS: Recreation management.

221. Wagar, J. V. K.

1940. Certified outdoorsmen. Am. For. 46(11):490-492, 524-525.

Modern man with easy access and insufficient know-how is destructive of nature. Suggests an outdoor certification program and methods by which this might be accomplished. This is a potential method of reaching people to educate them concerning wildlife-man interactions.

KEYWORDS: Recreation management, backcountry certification.

Bibliographies on Closely Related Subjects

(Also see reference numbers 31, 82, 87)

222. Bury, R. L., R. C. Wendling, and S. F. McCool.

1976. Off-road recreation vehicles, a research summary, 1969-1975. Texas Agric. Exp. Stn., College Stn., Texas. Texas A&M Univ. System. 84 p.

Contains section on effects of ORV's on wildlife. Reviews major papers on effects of snowmobiles on large animals, medium-sized animals, small animals, and fish, and ORV effects on desert animals.

KEYWORDS: Desert animals, wildlife, winter, ORV's, bibliography.

223. Hieb, S. R., ed.

1976. Proceedings of the Elk-Logging Roads Symposium, Moscow, Idaho. For. Wildl. and Range Exp. Stn., Univ. Idaho, Moscow. 142 p.

Symposium on effects of logging and roads on elk in the Western States. Many papers include information on elk behavior and various man-elk interactions related to logging and roads. Some management suggestions that could be applied to backcountry situations.

KEYWORDS: Elk, logging, roads.

224. Leedy, D. L.

1975. Highway-wildlife relationships, vol. 1. A state-of-the-art report. Fed. Off. Res. and Develop., Rep. FHWA-RD-76-4, Dec. 1975. 193 p. Fed. Highw. Admin., Off. Res. and Develop., Washington, D.C.

Assesses highway-wildlife relationships and suggests research and management to protect and enhance fish, wildlife, and environmental quality.

KEYWORDS: Wildlife, highway.

225. Leedy, D. L., T. M. Franklin, and E. C. Hekimian.

1975. Volume 2, An annotated bibliography. Fed. Off. Res. Develop. Report No. FHWA-RD-76-4, Dec. 1975. 427 p. Fed. Highw. Admin. Off. Res. and Develop., Washington, D.C.

Bibliography with detailed annotations. Includes a number of articles applicable to man-wildlife interactions in the backcountry.

KEYWORDS: Wildlife, highway, bibliography.

226. Luckenbach, R. A., and R. B. Bury.

[In Press]. Off-road vehicle impact on desert vertebrates: A review. In The physical, biological, and social impacts of off-road vehicles on the California desert. K. Berry, ed. Spec. Publ., South. Calif. Acad. Sci.

Excellent review of the effects of ORV's on animal groups from fishes, to large mammals. Research recommendations and extensive bibliography.

KEYWORDS: Desert animals, ORV's, bibliography.

227. Neil, P. H., R. W. Hoffman, and R. B. Gill.
1975. Effects of harassment on wild animals-an annotated bibliography of selected references. Colo. Div. Wildl. Spec. Rep. 37, 21 p.
- References and annotations on selected papers dealing with the effects on wild animals of ORV's, free-roaming pets (dogs and cats), urbanization, roads, wildlife habitat alterations, and hunting.
KEYWORDS: Wildlife, harassment, ORV's, dogs, bibliography.
228. Potter, D. R., K. R. Sharpe, and J. C. Hendee.
1973. Human behavior aspects of fish and wildlife conservation: an annotated bibliography. USDA For. Serv. Gen. Tech. Rep. PNW-4, 288 p. Portland, Oreg.
- Bibliography of human behavior aspects of fish and wildlife conservation. Oriented toward hunting and fishing, but some references apply to backcountry recreation.
KEYWORDS: Wildlife, recreation, bibliography.
229. Speight, M. C. D.
1973. Outdoor recreation and its ecological effects: a bibliography and review. Discussion papers in Conservation No. 4. 50 p. Univ. College, London.
- Contains section on impact of recreational activities on animals. Reference source for European literature.
KEYWORDS: Wildlife, recreation, bibliography, Europe.
230. Wall, G., and C. Wright.
1977. The environmental impact of outdoor recreation. Dep. Geogr. Publ. Ser. 11, Univ. Waterloo, Ontario, Can., 69 p.
- Contains section on wildlife that treats the direct effects of disturbance on wildlife as well as habitat changes caused by recreation. Reviews European, Canadian, and American literature. Includes impacts of motorized vehicles.
KEYWORDS: Wildlife, human impacts, Europe, bibliography.
231. Walter, H.
1978. Impact of human activity on wildlife. In Sourcebook on the environment. p. 241-262. K. A. Hammond, G. Macinico, and W. B. Fairchild, eds. Univ. Chicago Press, Chicago.
- An extensive literature review of impacts of human activities on wildlife, including plants. Reviews impacts resulting from human attitudes, pollution, development, overhunting, pesticides, fire suppression, and controlled burning. Includes European and African literature.
KEYWORDS: Bibliography, human impact, human attitudes.
232. Webb, R. H., and H. G. Wilshire.
1978. A bibliography on the effects of off-road vehicles on the environment. U.S. Geol. Surv. Open-file Rep. 78-149. 16 p.
- This bibliography has a section on ORV impacts on desert wildlife.
KEYWORDS: ORV's, desert animals, bibliography.

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Common and Scientific Names

Birds

Gaviiformes

Gavia immer

Anseriformes

Olor buccinator

Falconiformes

Gymnogyps californianus

Buteogallus anthracinus

Aquila chrysaetos

Haliaetus leucocephalus

Pandion haliaetus

Falco peregrinus

Charadriiformes

Larus argentatus

Sterna hirundo

Columbriformes

Zenaidura macroura

Passeriformes

Turdus migratorius

Sialia sialia

Euphagus cyanocephalus

Molothrus ater

Junco oregonus

Loons

Common loon

Waterfowl

Trumpeter swan

Vultures, Hawks and Falcons

California condor

Black hawk

Golden eagle

Bald eagle

Osprey

Peregrine falcon

Shorebirds, Gulls and Alcids

Herring gull

Common tern

Pigeons and Doves

Mourning dove

Perching Birds

Robin

Eastern bluebird

Brewer's blackbird

Brown-headed cowbird

Oregon junco

Mammals¹

Chiroptera

Myotis sodalis

Tadarida brasiliensis mexicana

Lagomorpha

Sylvilagus audubonii

Bats

Indiana or social myotis

Mexican free-tailed bat

Hares and Rabbits

Desert cottontail

¹Nomenclature according to J. K. Jones, Jr., D. C. Carter, and H. H. Genoways. 1975. Revised checklist of North American mammals north of Mexico. Occas. Pap. No. 28, The Museum, Texas Tech. Univ., 14 p.

Rodentia

Eutamias quadricolor
Eutamias townsendii
Ammospermophilus leucurus

Spermophilus variegatus
Dipodomys ordii
Peromyscus maniculatus
Neotoma spp.
Microtus montanus

Cetacea

Eschrichtius robustus
Megaptera novaeangliae

Carnivora

Canis latrans
Canis lupus
Ursus americanus
Ursus arctos
Ursus maritimus
Felis concolor

Artiodactyla

Cervus elaphus
Odocoileus hemionus
Odocoileus virginianus
Alces alces
Rangifer tarandus
Antilocapra americana
Oremnos americanus
Ovis canadensis
Ovis dalli

Rodents

Colorado chipmunk
Townsend's chipmunk
White-tailed antelope squirrel
(antelope ground squirrel)
Rock squirrel
Ord's kangaroo rat
Deer mouse
Woodrat
Montane vole

Cetaceans

Gray whale
Hump-backed whale

Carnivores

Coyote
Gray wolf
Black bear
Grizzly bear
Polar bear
Mountain lion

Even-Toed Ungulates

Wapiti or elk or red deer
Mule deer
White-tailed deer
Moose
Caribou
Pronghorn
Mountain goat
Mountain sheep
Dall sheep

Ream, Catherine, H.

1980. Impact of backcountry recreationists on wildlife: an annotated bibliography. USDA For. Serv. Gen. Tech. Rep. INT-84, 62 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

An annotated bibliography and evaluation of the literature on the effects of backcountry recreationists on wildlife. Literature was taken from biological, managerial, sociological, and popular publications. Orientation includes descriptions of impacts and methods of reducing impacts of recreationists on wildlife.

KEYWORDS: Backcountry recreation, wildlife harassment, bibliography.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

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